the child was required to look at the therapist for longer and longer periods of time. This phase of training was completed when the child was looking directly into the face of the therapist for as long as five seconds. Almost all training programs in use today include attention training as part of the overall curriculum to teach children to attend to the trainer.

The Lovaas program also described four training steps that were used to teach the children to imitate sounds and words. First, all vocalizations that were made by the subjects were immediately followed by bits of food. This usually caused the rate and diversity of the vocalization to increase; second, reinforcement was available only if a vocalization occurred within six seconds of the therapist's model. For example, the therapist would say to the child, "Say AH" and wait silently for six seconds. If the child vocalized in any way during the six second interval, the therapist praised the child and give bits of food. If the child did not vocalize, the experimenter simply waited, and then represented the instruction, "Say AH." The third step required the child's vocalizations to closely approximate the therapist's model "AH." When the child was repeating the model almost every time it was presented, a new sound was selected and trained following the sequence of step three. Thus, step four was merely a repetition of step three but with a new sound modeled. This process continued until the children could imitate almost every word presented on the first try. The next major step was to teach the child to label objects, places and actions. This was accomplished by using procedures similar to those that had been described by Wolf, et al., (1964). An object was presented to the child by the therapist and as soon as the child looked at the object (i.e., BALL) the therapist said "Ball" and reinforced any imitation of that model by the child. Gradually, the therapist's vocalizations were faded until the sight of the ball alone was enough to evoke the labeling response from the child.

More labels were trained in this manner and interspersed with those that had already been learned. In addition to presenting the object to be labeled, the therapist also said, "What is this?" Correct responses to this question demonstrated that the child had learned a productive labeling skill. Receptive labeling occurred when the child would "point to" an object rather than vocally labeling it when instructed to do so.

From labeling common objects and simple action behaviors such as walking, running, laughing, etc., the Lovaas program moved to more and more abstract linguistic concepts such as preposition use, pronouns, and time. The eventual goal was to teach the children to use conversational speech spontaneously.

The language intervention research at the California laboratory and the language research that was appearing in the professional literature (Guess, et al., 1968; Shumaker and Sherman, 1970; and Wheeler and Sulzer, 1970) on generalized verbal imitation and the generalization of functional speech and language skills, did much to bolster the learning theory account of language development. These successes stimulated other language researchers to examine the feasibility of designing comprehensive intervention curricula for the language deficient community.

Operant research has had an obvious effect on the way language training is being conducted in centers for the speech and language handicapped throughout the country. In addition, Lois Bloom's (1970, 1974) recent work (done from thr psycholinguistic point of view) has also had a major impact on language training. Her work has presented a challenge to the strict Chomskian position that language should be treated as a syntactic system, independent of the semantic aspect of language. Bloom's (1970) study, in particular, has had a direct impact on almost all of the existing language intervention programs especially those that support a psycholinguistic approach to language training such as Miller and

Yoder (1972a, 1972b, 1974), Stremel and Waryas (1974), and MacDonald and Blott (1974). In this study, Bloom assessed the emerging grammars of three children over a period ranging from 9 to 18 months. At periodic intervals, a research team visited each child's home and collected speech samples by recording everything said by the children, and in what context the utterances occurred. The results showed that all of the children eventually began to express basic grammatical relationships. These relationships appeared as SUBJECT-OBJECT, SUBJECT-VERB, and VERB-OBJECT. An awareness of the more complex grammatical relationship SUBJECT+VERB+OBJECT string was implicit in these early utterances even though the children were only uttering two word strings. According to Bloom, these kinds of interpretations could only be made if the utterances and the circumstances surrounding them were considered as a unit. Bloom's famous example clearly serves to demonstrate her findings: in one instance a child said "Mommy sock" while the mother was putting a sock on the child. In another instance, the child said "Mommy sock" but this time the child was picking up the mother's sock. Bloom discussed her results as follows:

> In summary, the children's earliest sentences could thus be seen as expressing (1) grammatical relations, where substantive words such as "Mommy" and "sock" occur with variable grammatical meaning in reciprocal relationship with other substantive words, and grammatical meaning is derived from that interrelation. Substantive words such as "Mommy" and "sock" enter into grammatical relationship with other words in sentences. They are not in themselves relational terms in the sense that they also occur alone in reference to some aspect of experience. Children's earliest sentences also express (2) functional relations, where function words such as "more" and "no" operate in a linear relationship with other (substantive) words to specify a particular relational aspect of such words (or their referents). Spoken alone as single-word utterances, such words manifestly imply such a semantic relationship to some unspecified aspect of experience. (Bloom, 1972, p. 23.)

Bloom's work was supported by Schesinger (1971), Brown (1973) and Bowerman (1971). Thus with minor disagreements among the leading psycholinguists, the

general consensus was that language was learned as relational functions. Some of the functions language observed were to signify recurrence ("more"), non-existence ("no"), disappearance ("gone"), rejection ("no"), cessation ("stop"), existence ("there"), possession ("mine"), etc. Thus almost all of the psycholinguistically based training programs attempt to teach these functions at the one-word level (i.e., Agent such as "Mom," "boy," etc.), then at the two-word level (i.e., Agent + Action such as "Boy run," etc.), and eventually at the three (i.e., Agent + Action + Object) and four utterance levels.

An Integrated Approach to Language Training

Most of the language intervention programs and theoretical strategies for intervention reviewed in this section reflect an interaction between psycholinguistic and learning theory. The programs vary considerably, however, in the extensiveness of the interaction. The Guess, Sailor, and Baer (1976) curriculum comes closest to representing the "straight" learning theory account of language development. Modeling, imitation, reinforcement, and an operant remedial logic represent the fundamental underpinnings of the program. Other strategies incorporate operant conditioning principles into their intervention designs, but identify them as effective teaching techniques rather than as theoretical constructs for language acquisition. This view is most emphatically presented by Miller and Yoder (1974) ..."No language program can possibly teach all of the responses a child will need (or could naturally make) simply by a program employing imitation, modeling, and differential reinforcement. Such programs only allow for the acquisition of echolalic surface structures." (p. 506.)

The Miller and Yoder Curriculum

Miller and Yoder (1972a; 1972b; 1974) present a rationale of language intervention that is based on psycholinguistic data. A single curriculum guide or program manual is not yet available, and it is necessary for anyone interested in developing an intervention model based on Miller

and Yoder's strategy to become familiar with at least some of the psycholinguistic literature. In particular, the work reported by Bloom (1970, 1973), Brown (1973), Schlesinger (1971), and Bowerman (1971) would be helpful when considering the model offered by Miller and Yoder.

In their 1974 publication, Miller and Yoder use four guidelines to structure language training. First, they believe that the content of any language training program should come from what is known about normal children's development. For them, ..."a language teaching and modification program should be developed from what is known about the language code, its structure, function, and its development and use in children with unimpaired intellectual functioning" (Mental Retardation, 1972. p. 8). Because current psycholinguistic data show a considerable shift away from a syntactically structured program to a semantically structured language development process, intervention strategies should identify semantic concepts to provide an early basis for language acquisition. Bloom (1971, 1974), Schlesinger (1971) and others have identified "language functions" in their observations of normal children's syntactic acquisition process. For example, some of these functions may be expressed by using a single word. "No" can express the function of rejection; "more" the function of recurrence; and "stop" the function of cessation. Other relational functions have been identified and the terminology used to describe these functions varies slightly depending on which psycholinguistic source is read. Miller and Yoder mainly use Bloom's (1971, 1974) terminology to identify semantic functions. Bloom suggests that words like "Mommy," "Daddy," etc., might express an AGENT OF AN ACTION FUNCTION or an OBJECT OF AN ACTION function. The primary goal of the Miller and Yoder intervention strategy is to teach as many semantic functions as possible. To determine which function should be taught first, Miller and Yoder suggest observing the language deficient child in the environment

to which he is accustomed. Those semantic functions that occur most frequently should be identified and trained since..."It is essential for the child's own unique experiences to serve as the basis for training, thereby maximizing what the child brings to the learning situation in terms of his potential perceptual-cognitive awareness of objects and events about him" (1974, p. 518). As soon as the "target" semantic functions have been identified, all subsequent training should be designed to establish the meaningful expression of the function by the child. First, the child must associate the semantic function with its label. Just how much exposure to such an association is required is not clear. Nevertheless, the next step is to determine whether the child comprehends the relationship between the semantic function and its label. An imitation paradigm is used to teach the child to reproduce the label (or lexical marker) in the presence of the semantic-function being taught. Other familiar experiences are gradually introduced that express the same semantic function just mastered. When the child has begun to express the newly trained functions spontaneously, the utterance is exparded to two, three, or even four words. Thus, the child eventually uses three and four-word utterances to express functions such as AGENT + ACTION + OBJECT, AGENT + ACTION + LOCATION, or AGENT + OBJECT + LOCATION.

Stremel and Waryas Curriculum

Stremel (1972) and Stremel and Waryas (1974) have developed an intervention program that shares many common features with Miller and Yoder's model. This one, however, is considerably more specific in describing its procedures and training sequences. As with the Miller and Yoder program, a prospective user of this intervention model would benefit by becoming familiar with psycholinguistic literature. Stremel and Waryas report that their strategy has been used with considerable success to improve the language skills of residents of the Parsons State Hospital and Training Center, Parsons, Kansas.

Stremel and Waryas' interpretation of previous linguistic analyses embraces the tenet that children's early language acquisition is best described as a rule-governed system that progresses in sequential stages. According to Stremel and Waryas, the regularities observed in linguistic development on semantic, syntactic, and on phonological levels imply that any language-performance level depends necessarily on a prior level of linguistic development. Following the guidelines offered by Bloom (1971, 1974) and other psycholinguists, Stremel and Waryas stress the teaching of grammatical forms (SUBJECT + VERB + OBJECT) to express various semantic relationships.

Individual responses within each step of the program are taught by applying operant conditioning principles. The technology that was refined by applied behavior analysts during the 1960's is apparent in this program's use of stimulus control programming techniques, shaping responses through the use of differential reinforcement, pre-and post-test measures, etc. Edibles, tokens, and social praise are considered to be viable reinforcers to consequate behavior. Thus, the authors have combined psycholinguistic theory and operant technology to structure a potentially effective language training program.

The program has been divided into three main sections: I. Early-Language Training; II. Early-Intermediate Language Training; and III. Late-Intermediate Language Training. A child's placement in the program depends on a set of entry behaviors. For example, in order to enter Early-Language Training, a candidate should be able to grossly attend to the supervising adult, follow simple instructions, comprehend and label at least ten pictures or objects. It is obvious from the program's entrance criteria, that it is not intended for very low functioning children. In order to enter this program, a child must show that he possesses at least a rudimentary linguistic repertoire. Children who are nonverbal, non-imitative, or under very poor instructional control would not benefit from Stremel and Waryas' program.

Initially, the Early-Language Training phase teaches the child to express a wide range of nouns and verbs; then, language structures such as NOUN + VERB ("Mama go") and VERB + NOUN ("want cookie"). As training progresses, these grammatical structures are expanded to include pronouns, adjectives, prepositions, and the who-what-where questions. Training emphasizes both the receptive and productive use of these basic grammatical structures. After the child has mastered most of the grammatical structures trained in Phase I, he is advanced to Early-Intermediate Training. During this phase, group instruction may replace one-to-one instruction. Training in this section focuses on expanding the child's use of his basic grammatical repertoire and teaches the productive and receptive use of auxiliary verbs, negatives, and possessives. The final phase continues to build the child's grammar and use of syntax by teaching plurals and noun/verb tense agreement along with other forms.

Stremel and Waryas candidly point out that there is a need to assess whether the newly acquired language repertoire does in fact, generalize to nontraining situations. Indeed, this is a major issue that all of the programs reviewed in this section need to attend to.

MacDonald and Blott Curriculum

In 1974 the Nisonger Center at Ohio State University, Columbus, Ohio, announced the development of the ELIS, a semantic-based assessement and training strategy to teach early expressive language (MacDonald, J. D., and Nichols, M., 1974a; MacDonald, J. D., Blott, J. P., and Gordon, K., 1974b; MacDonald, J. D., and Blott, J. P., 1974c).

The major objective of the ELIS was to teach a functional use of language in children who were already using single words communicatively. The specific content was based on psycholinguistic data, particularly the work of Schlesinger (1971). Essentially, eight semantic-grammatical rules that were identified by

Schlesinger served as the basis for training. All of the rules expressed specific function similar to those used in the two previously reviewed programs. For example, the utterance "DADDY THROW" might express the AGENT + ACTION rule function; the utterance "THROW BALL" might express the ACTION + OBJECT rule; or, "NO BALL" might express negation function. Rules that are trained first, are those that have been observed to occur most frequently in the child's language repertoire.

One particular feature that distinguishes this program from others concerns the manner in which the semantic-grammatical functions are trained. Imitation, conversational, and structured-play training occur concurrently so that the child will begin to use the newly acquired structures functionally as soon as they are mastered imitatively. The purpose of the imitation phase is to teach the child to produce particular semantic-grammatical utterances so that control of the utterances can be more easily shifted to conversational and spontaneous use. The child is asked to imitate a two-word utterance in the presence of two discriminative stimuli. First, the child is given a model, or linguistic cue, such as the instruction, "Say, throw ball." A second discriminative stimulus is paired with the instruction that is functionally tied to the utterance. An example would be to always throw a ball up into the air each time the child is asked to say "Throw ball." The consequences for a correct imitation include the repetition of the original model "Throw ball," social praise, and a token. A brief time out period follows incorrect imitations by the child before a new trial begins.

Conversational training runs concurrently with imitation training. The discriminitive stimuli are slightly altered during this phase so that a more conversational-like response is given. The nonlinguistic cue remains the same (throwing a ball into the air). The verbal cue, however, is changed from "Say, 'throw ball'"

to "What am I doing?" Correct approximations are reinforced in a like manner to imitation training, and whenever necessary, a prompt such as "say throw ball" is provided to increase the likelihood of a reinforcable response.

The structured play phase of the training program runs concurrently with the two phases already mentioned. As for the earlier phases, specific discriminative stimuli, expected responses, and programmed consequences are clearly given. The following passage might best serve to summarize the ELIS:

> "...On the basis of the experimental subject's baseline performance on the ELIS, the action + label and X + locative rules were selected as the major classes for training, for three reasons. First, they were the two most frequent rules in the subjects' baseline performance. Second, they are those rules reported by recent investigators to be the relations occurring most frequently in early normal language development (Brown, 1973a). Finally, action + object and X + locative appeared to be rules with sentence integrity and ones from which longer, more complex utterances could generate easily..." (MacDonald, J. D., Blott, J. P., and Gordon, K., /1974/, p. 399).

Thus, like the programs already discussed, the ELIS uses the most recent psycholinguistic data to develop the training content, applies contingencies of positive reinforcement and time out procedures, and requires that prospective students possess a language repertoire at the single word level.

The Bricker Curriculum (Bricker, Dennison, and Bricker, 1975)

The Constructive-Interaction-Adaptation Approach to Language Training represents the most recent revision of the Brickers' language intervention program. As in some of the previous versions of the Brickers' work, this strategy embraces psycholinguistic theory, operant conditioning principles, and Piagetian thought. It is one of the most comprehensive language intervention programs included in the review. For some users, however, its comprehensiveness might be considered somewhat of a handicap, especially for those who have little control over the environments where speech deficient students live. This point will be discussed in more detail later.

Piagetian principles of infant's cognitive development, especially during the first two years of life served as a model for structuring the Bricker-Dennison-Bricker program. Piaget has described the first two years of life as being a sensorimotor period. During this period, the infant is almost continually interacting with (or exploring) his environment. Eventually, the infant learns that objects endure or remain the same even though they are perceived from different angles or when the infant temporarily looks in another direction. Object permanence marks the beginning of a process by which the infant assimilates and organizes new events with those that have been previously learned. Some of these "events" relate to language behaviors, and thus, the Brickers have emphasized this period as being critical for language training. They say:

> "...A child acquires many skills before he emits his first word and investigators such as Piaget and Inhelder (1969), Sinclair-de-Zwart (1969), and W. Bricker and D. Bricker (1974), have pointed out the potential importance of earlier forms of behavior for language development. Thus, the infant's interaction with his environment (e.g., sucking, tracking, grasping) can be seen as a basis for later language development. With the language deficient child some of these preliminary or prerequisite skills may have to be taught or shaped into the child's repertoire prior to training language." (1975, p. 6.)

Within the Piagetian framework, 24 training phases have been structured. Each phase has been sub-classified under one of five gross headings. They are Attending Skills, Imitation, Functional Use, Comprehension, and Production. Phases 1, 2, and 4 fall under the heading "Attending Skills"; Phases 3, 5, 6, 7, 8, 12, 13, 16, 19, and 22 teach "Imitation" skills of different topographies; Phases 10 and 11 teach the child that objects may serve a function and that they may be used in play activities; Phases 9, 14, 17, 20, and 23 teach the comprehension of single words and grammatical strings (sentences); and Phases 15, 18, 21, and 24 teach children to express words and grammatical strings.

Although the phases are consecutively numbered for convenience, training does not proceed consecutively. Instead, two and possibly three phases could be trained concurrently. For example, Phase 22 is designed to teach the imitation of three-word strings such as "BOY EAT COOKIE." Concurrently (but not in the same session), the child is taught to comprehend the meaning of AGENT + ACTION + OBJECT grammatical relations; "BOY EAT COOKIE" is one (Phase 23) such relation. It is conceivable that expressive training on these same forms could also be trained (Phase 24). Similar strategies are seen in all of the programs reviewed so far, especially in the ELIS. In the ELIS, imitation, conversation, and structured-play training occur concurrently.

An obvious requirement for any comprehensive program is to include guidelines for student placement - an assessment device. Bricker, Dennison, and Bricker suggest "...if a child already comprehends the names of many objects and actions such as cup, baby, drink, and eat, training should probably be initiated with the comprehension of two-word utterances." Thus, each training phase is accompanied by a set of assessment guidelines. The proper use of these guidelines should enable the teacher to place the child at the most appropriate point for training.

Some of the training features unique to the Bricker-Dennison-Bricker program relate mostly to the author's attempts to incorporate training into the Piagetian framework. For example, the Bricker-Dennison-Bricker program and the Lovaas program developed in 1964 each use reinforcement techniques to increase vocal rate before imitation training is begun. In the Lovaas program, four highly structured training steps are described which eventually lead to the establishment of vocal imitation (Lovaas, 1966). The criterion to move from the first step to the second occurred "...When the child reached an achievement level of about one verbal response every five seconds and was

visually fixating on the adult's mouth more than 50 percent of the time..." (Lovaas, 1966, p. 1). The Bricker-Dennison-Bricker approach is considerably less structured. They suggest that once a baseline has been taken on the number of times a child vocalizes during a certain period of the day, stimulating activities and interaction should involve both the child and teacher in an attempt to increase the child's vocal behavior. They suggest that during the activities, the teacher should "make cooing or babbling sounds. These vocalizations stimulate the child to make 'happy vocalizations', such as laughing and cooing...you might place the child near a record player or a radio which may prompt the child to make sounds" (p. 43). Thus, the Brickers de-emphasize structure in favor of extensive stimulation to accomplish a generalized verbal imitative repertoire. Another example of the Piagetian influence in the Bricker-Dennison-Bricker program is seen in Phases 10 and 11. The goal of Phase 10 is to establish different action patterns. By "experimenting" with different action patterns, the child learns "to anticipate the effect their actions have on objects, persons and events." By this process, the child learns such attributes as weight, texture, color, etc. Eventually, "the child begins to associate the words and sounds he hears in his environment with the particular action and object in which he is engaged."

The Constructive-Interaction-Adaptation Approach as the Brickers' program is entitled, attempts to incorporate language training into the more global conceptual developmental process rather than treating it as a separate entity. They require that the child's total experience contributes substantially to the language learning aspect of cognitive growth, and any attempt to teach speech and language should embody as much of the "natural world" into training as possible. Thus, it is important that as much of the child's environment be included as part of the "training environment." For the language trainer who

is able to work with a particular child at a predetermined specified period of time (possible for a half-hour per day), the Constructive-Interaction-Adaptation Approach might be too demanding. However, for agencies that are able to establish "early infant stimulation" environments, then, the Bricker-Dennison-Bricker would be a most suitable model to follow.

The Language Acquisition Program (Kent)

The LAP (Kent, 1974) was "developed for institutionalized, severely retarded, nonverbal children from five to 20 years old." The 1974 edition evolved after eight years of work by the author and her colleagues. It is one of the only curricula reviewed in this report that includes students who lack speech and language completely.

Language instruction is conducted in a much more structured manner than in most of the previously reviewed programs. The author stresses the importance of one-to-one instruction throughout, but does suggest that two students could receive training during a single session. Such simultaneous training, however, should only be conducted with children who are under good instructional control. All of the training procedures throughout the program have been based on operant conditioning principles.

The training manual has been divided into three sections. They are Pre-Verbal, Verbal-Receptive, and Verbal Expressive. The Pre-Verbal section teaches attending skills and specific motor imitations that are considered to be prerequisites for performance in later phases of the program. The first phase of Section I was designed to teach the child to sit in a chair. Next, stereotyped or interferring behaviors such as rocking, climbing, gazing, etc., are eliminated by employing overcorrection procedures recently described in the literature (Azrin, Kaplin, and Foxx, 1973). Once the child is sitting reasonably still, the child is taught to look at objects and at the trainer's face by

responding to questions such as "look at this" or "look at me." The final phase in this section teaches specific motor imitations in response to the instruction (and model) "DO THIS."

The training sequence, definitions of each behavior, and the criterion for advancing from phase to phase are clearly presented in the text of the manual and later in a numerical sequence. The child is regularly tested throughout training to ensure that he has remembered what has been previously trained and to guide the trainer in deciding what phases need to be trained next.

The entire second section of the program concentrates on developing a fairly comprehensive receptive language repertoire. Initially, the motor responses that had been taught imitatively in the previous section, are brought under instructional control. In a successive manner the child gradually learns (via a pointing response or an action) body parts, simple objects, and to comply to simple instructions such as "sit down," etc. This basic receptive vocabulary is expanded throughout the remaining phases in this section until the child is able to understand and comply with such instructions as "Make a circle" (with a magic marker), "make a tower" (with blocks), etc.

The first phase in the Verbal-Expressive section reverts back to (verbal) imitation. The early emphasis is devoted to building a generalized verbal repertoire through the use of standard reinforcement and shaping techniques. Once the child has learned to reproduce single-word utterances imitatively, control is then switched to instructions such as "What is this?" or "What is in the box?" The training rationale in this section follows the same "expansion" paradigm used in the previous section but in the verbal mode.

One additional feature of the Kent program is its adaptation (by Martha Snell) to a nonoral approach for use with hearing impaired and deaf children.

Guess, Sailor and Baer Curriculum

This language intervention program is based on a learning theory account of language development. Consequently, most of the operant procedures that were used in the laboratory to experimentally analyze speech and language behavior represent the program's primary teaching strategy. Several modifications in the Guess, Sailor and Baer have been published in various sources and at various times (Guess, Sailor and Baer, 1974; Sailor, Guess and Baer, 1973; Guess, Sailor and Baer, 1976), but the one which served as the basis for this review was the latest edition (Guess, Sailor and Baer, 1976). This portion of the completed curriculum presents the first nine training steps in a "training manual" format. Other publications (Guess, Sailor, Keogh and Baer, 1975) have identified 60 individual training steps that were previously field tested in an "experimental version." As the field test results of the subsequent training steps are fully analyzed, these too will be published in addition to the first nine.

Unlike the comprehensive Bricker, Dennison, and Bricker program (1975) this one emphasizes the importance of rapidly bringing children into contact with "communication" as an effective mode of controlling the environment. Above all, this process can be effective only if language is functional. Secondly, the authors suggest that functional communication training must be engineered in such a way so as to allow children to expand their own language repertoires. This might be done, for example, by teaching the children to ask "what's that?" when confronted by a significant environmental event for which they have no label (or lexical marker). Third, the entire thrust for teaching functional communication depends on flexible strategies that are easily shifted from one design to another as ongoing data dictate.

Within this basic framework, the sequence of training has been organized according to five dimensions: reference, control, self-extended control, integration and reception. Reference assumes that the fundamental function of language is to symbolize. Thus, Step 1 teaches children that words can be used to symbolize persons and things in the environment. In this step, children are taught to label or name 16 common objects. The individual trainer is encouraged to select 16 objects that seem most appropriate for the particular child being trained. The control dimension is designed to teach children to request further, specific training inputs based on their discrimination of what they do and do not know. Step 3 attempts to teach the children to use functional language to exercise some control over their environment. It is done by teaching children to request an object by uttering "Want (desirable item)," and later in Step 8 by making the same request but in a more grammatical way (e.g., "I + WANT + /desirable item/.").

The self-extended control dimension is taught in Step 4. Here the child learns to ask "WHAT'S THAT?" when shown novel objects. Throughout the entire program every correct response made by the child is immediately reinforced. Sometimes reinforcement is the "natural" result of the child's utterance. For example, the receipt of a cookie after the utterance "Want cookie" is a reinforcer specific to the request; at other times the receipt of an M & M plus a ball after the child labels the object as a "ball" might be necessary early in training.

The reception dimension corresponds to those skills taught during speech production procedures. For example, Step 2 teaches the child to "point to" those items that had been earlier trained productively. Another example of the receptive dimension of language training occurs in Step 7. In this step the child is taught to demonstrate his receptive competence by saying "yes/no"

instead of using a pointing response. The child is asked a question such as "Is this a ball?" From the child's previous experience (Steps 1 and 2) the child learns to integrate the dimensions of the object in question and the statement of the teacher to produce correctly "Yes" or "No." The dimension of integration is more explicitly established during training Steps 5, 6, and 9.

In Step 5, the child is shown some objects that he has learned to label (Step 1) and some that he has probably never seen before. For objects that he has already learned to label earlier in training, the correct naming response is expected. For objects that are novel, the child must ask "What's that?" Thus Step 5 integrates the skills mastered during Step 1 and during Step 4 of training. Step 6 has been included as an extension of Step 5, since at some time it is expected that the "What's that?" response should eventually be replaced by a naming response. If it does not occur during Step 5 it is specifically programmed in Step 6.

The final step (Step 9) in the recently published version teaches verbal response sequences that more closely resemble conversational speech. For example, the child might be shown an object (such as a cookie) and asked "What is that?" The expected response is "cookie." Next, the trainer asks "What do you want?" with an expected response of "I want cookie." This step integrates what he has learned.

The appropriate starting point for a child's entry into the program is determined by the child's score on a "Skill Test" given prior to training on each step. A basic criterion for acceptance into the program is the child's competency as a generalized verbal imitator. Although the program does not specifically provide procedures to assess a child's imitative repertoire, it is assumed that the candidate possesses a fairly competent imitative repertoire. Thus the entry behaviors required by Guess, Sailor, and Baer are similar to

those required by Miller and Yoder, Stremel and Waryas, MacDonald and Blott, yet the training content, sequence, and reinforcement procedures vary considerably between programs.

The recommended teacher:student ratio is one-to-one. In the past, strict one-to-one training environments seemed to operate against the generalization of learned behaviors to new settings. Recognizing this, the authors have offered some guidelines designed to foster generalization of language skills taught in training sessions.

The Illinois Program

Systematic Language Instruction (Tawney and Hipshire, 1972) was designed to help teachers who were relatively inexperienced in the area of speech and language intervention to effectively modify the language behavior of mentally retarded children. The program's curriculum has been structured so that pre-imitative children, as well as more linguistically advanced children can be taught specific language skills. Although each training step can be carried out in a one-to-one format, the authors emphasize the importance of small group instruction, especially during the latter phases of the program.

Operant conditioning and stimulus control techniques are employed as the basic teaching strategy. Each step in the program is accompanied by a definition of the "target" behavior, the pre-requisites necessary to enter a step, and a pretest-posttest procedure to assess if the child can pass through a step, and whether he has mastered a step after training.

The curriculum emphasizes the receptive aspects of communication such as instruction following. For most phases, the student must use a pointing, or a motor response to demonstrate comprehension of a language concept. For example, the lesson plan entitled "MULTIPLE COMMANDS: THE USE OF 'AND'" was designed to teach the child to perform two actions in sequence. Specifically,

the child may be taught to follow commands such as "Run to the door and clap (your) hands," "Run to the door and sit down on the floor," "Walk to the window and clap your hands," etc. There are some lesson plans, however, that do provide procedures for teaching a productive language skill. Teaching "YES" - "NO" responses to questions is an example.

The general sequence of instruction is presented by the authors as follows: 1) shape attending behaviors such as "Good sitting," "Good listening," etc., 2) teach the child to point or touch objects when requested to "TOUCH" and "TOUCH ANOTHER," 3) teach the child to discriminate between objects, actions and persons by pointing or touching, 4) establish speech sounds, 5) shape speech sounds into single word utterances, 6) teach the child to "touch" in conjunction with the vocal responses, 7) fade the importance of touch and teach concepts at the verbal level, 8) expand one word utterances to two and three words, 9) combine noun and verb phonemes, and 10) reinforce spontaneous utterances both in and out of the training setting.

Language Development-Perceptual Motor Training Program

This training manual (Flahive, et al., 1973) was developed at the Muskegon Regional Mental Retardation Center to serve as a guide for child care personnel for teaching severely retarded children a wide number of functional language skills. It represents a modification of an early version of the Bricker-Dennison-Bricker program. As for the Bricker program, operant conditioning techniques are used to shape desirable language behavior. Unlike the Brickers' program, however, this strategy teaches only receptive language skills.

The manual is divided into six (color coded) sections. The first section, called the Reinforcement Program, suggests ways to establish good instructional control. The child is reinforced for setting appropriately, maintaining good eye contact, and in general, for demonstrating appropriate attending behavior.

As soon as the child is under good instructional control, motor imitations (section two) are established. This section teaches both fine motor and gross motor imitations.

The third section teaches some receptive vocabulary skills similar to those just discussed in the Tawney and Hipsher program. However, the terminal receptive skills in this program involved self-help skills. For example, the child is taught to follow commands such as "Put your shirt on" in addition to instructions such as "Point to the (picture)." Section four expands the child's receptive vocabulary by teaching spatial relationships, some action verbs, color labeling, geometric shapes, and numbers (one-two-three).

The fifth section provides suggestions to further develop the child's gross and fine motor skills. Activities such as sorting, coloring, pasting, water play, are programmed within a mode of verbal and nonverbal interaction. The final section offers a list of materials that may be used as training stimuli for gross and fine motor activities.

The Teaching Research Initial Expressive Language Program

This program (McDonnell, et al., 1975) used a behavioral approach to teach expressive language to speech deficient children. The authors state that after successful completion of the program a child should be able to converse using five word utterances. Eight training phases comprise the entire curriculum. Phase I teaches the child to maintain eye contact with the teacher; Phases II, III, IV, V, and VI teach a generalized verbal imitation repertoire; Phase VII teaches object and action labeling; and finally, Phase VIII uses chaining, imitation, and reinforcement to teach the five word chain.

The program places a great deal of emphasis on vocal and verbal imitation without introducing functional language use (either productively or receptively) until a fairly well developed imitative repertoire has been established. This

method of training contrasts with many other programs that use imitation procedures. For example, the ELIS use of imitation procedures is in conjunction with simultaneous training involving conversational and structured play. The goal is to make utterances functional as soon as they are learned imitatively. In addition to the curriculum sequence, the manual provides a section that defines terms like reinforcement, responses, imitation, and others commonly used when operant conditioning procedures are described. Recording and graphing procedures are explained. Over 375 stimulus cards, 50 data sheets, and six student placement tests are provided with each training manual.

Speech and Language Training Programs for Developmentally Disabled Children

The inclusion of Stewart's (1973) program in this review represents an exception to the criteria used for selecting language training strategies. It is similar to some of the other programs reviewed and it is relatively obscure. It was included because its curriculum is almost identical to the McDonnell, Fredericks and Grove (1975) program reviewed above. This one, however, is available for $5.00 instead of $25.00. The major differences between the two programs are: 1) the $25.00 program is reproduced on better quality paper and is more elaborately bound; 2) Stewart's program does not have separate picture cards to be used as training stimuli, but includes appendices to the manual that show pen and ink drawings of common objects and pictures of action verbs; 3) the McDonnell, Fredericks and Grove program more extensively describes operant terms and scoring and assessment procedures.

The Peabody Language Development Kits for Level # P

The Level # P kit (Dunn, Horton and Smith, 1968) was designed to stimulate production and receptive language (particularly syntax and grammar) in children who already possess a modest speech and language repertoire. Specifically, young school-aged educable retarded children, pre-teenaged trainable retarded

children, kindergarten children from disadvantaged areas, and average three and four year old preschoolers represent the population for which the kit was intended. The curriculum might be more aptly described as an "enrichment" program rather than an "intervention" program that is designed to specifically develop speech and language behavior in nonverbal children.

Although teachers of the Level # P program are encouraged to recognize the importance of behavior modification techniques to reinforce desirable behaviors, the theoretical basis for the program's curriculum is psycholinguistic rather than behavioral. The program's content and structure have been divided into 180 daily units and each unit has been further divided into one 20-minute morning lesson (called Part A) and one 20-minute afternoon lesson (called Part B). All aspects of the child's class experience emphasize the appropriate use of syntax and expansions of grammatical forms. A prominent feature of the program is that it has been designed for classroom (group) use. All of the lessons can be completed in one academic school year (e.g., 180 days).

Non-Slip (Non-Speech Language Intervention Program)

The Carrier and Peak (1975) program is a recently published comprehensive nonspeech communication system developed specifically for severely and profoundly retarded persons. The authors correctly point out that most of the language intervention programs in use today have failed with this segment of the language deficient population..."because most attempts to teach low level retardates have been based on programs or training procedures developed primarily for higher functioning children" (Carrier and Peak, 1975, p. 4).

A major impetus prompting the development of Non-Slip came from some of the important chimpanzee research dealing with communication systems among primates. In particular, the accomplishments of the Gardners' and David Premack are reflected in Carrier and Peak's program. Instead of teaching within the

speech modality, students in Non-Slip are taught to manipulate plastic symbols that are used to represent articles, nouns, verbs, and prepositions. The teaching method employs operant conditioning principles, particularly reinforcement techniques, to shape criterion behavior.

Before the grammatical strings are taught, a series of important pre-requisites must be mastered. In fact, considerably more time may be spent teaching students the Non-Slip pre-requisites than the communication phase. As pre-requisites to communication training, the student must be able to pick up plastic symbols and place them on a wooden tray, then, via a match to sample paradigm, discriminate between various symbol shapes, between pictures or objects, between pictures and their plastic-symbol representations, between five colors, and finally, between one and two stripes that run across a corner of the symbols. For those who have had experience working with severely and profoundly retarded children, the pre-requisites required by Non-Slip are indeed challenging.

Like most of the programs presented in this section, Non-Slip is intended to teach only those language behaviors that are judged to be necessary for an individual to perform the basic functions of communication. Once the pre-requisites are learned, the first step in teaching a student basic communication functions is to teach him to rotely string seven symbols together in a specific sequence by placing them on the wooden tray. The seven component sequence consists of an ARTICLE + NOUN + VERB AUXILIARY + VERB + PREPOSITION + ARTICLE + NOUN. Once the sequence has been mastered, the student is taught that each of the slots in the seven-component-string represent specific "symbol classes." For example, the second slot is filled by selecting a plastic symbol from the symbol class "Nouns," the fourth "Verbs," the fifth "Prepositions," and so on. The color and stripe descriminations that were mastered during pre-requisite training serve to distinguish the first appearing nouns and articles from those appearing later in the sequence, thus teaching the child to sequence the symbols "grammatically."

The first phase of the Non-Slip requiring the student to make an "abstract" association is the labeling phase. Since the child already has been taught to match symbols with symbols and pictures with pictures, this phase attempts to teach a symbol-to-picture match. That is, the child is shown a picture of a boy, girl, man, lady, baby, dog, cat, horse, cow and a bird (at first, one at a time) and required to "label" the picture by selecting the symbol that identifies the particular picture. The other grammatical classes are taught in a similar fashion until the child has learned the rudimentary communication system.

Conclusions

The speech and language intervention programs presented in this section represent a cross section of language remediation strategies in use today. Undoubtedly, there are other programs that could have been included in this review but were not. We are reasonably sure, however, that all of the major intervention "strategies" to date have been well represented.

Each intervention strategy evolved as a result of years of thorough research by developmental psycholinguists, learning theorists, and others interested in speech and language. The authors of each of the programs described can easily point to a segment of the professional literature and build a reasonably strong case to support the rationale for their particular intervention model. Data to substantiate a particular "rationale" abound; data to substantiate the effectiveness of a single intervention program are sorely lacking, however. Clearly, a next step for all language intervention programs is to support "strategy rationales" with data showing the effectiveness of a particular model. Considering the recent advances made in the experimental designs of applied researchers, it is well within the capabilities of language researchers to conduct controlled studies showing the usefulness of a particular language intervention. If these data were available today, the magnitude of basic theoretical

issues concerning language development would be reduced considerably. Until they become available, the theoretical and methodological issues that began to emerge during the 1960's will persist.

Summary Recommendations

1. Although all of the comprehensive speech and language intervention strategies reviewed in this section appear to be potentially effective, none has published data to document this effectiveness. Evidence showing that a modest speech and language repertoire can be developed in severely handicapped children has come from the experimental laboratory. These data were derived under stringent environmental conditions and most often by highly skilled technicians. The need exists to show that (1) the comprehensive programs as offered actually remediate language behavior and (2) the programs can be understood and effectively administered by paraprofessional personnel. All further observations will be offered relative to the one made here.

2. Rightly or wrongly, comprehensive language programs have made one fundamental assumption: That many highly specific and unique language training procedures (developed in the laboratory with single subjects) can be strung together to form a workable intervention curriculum. That is, if it has been shown that Child A can be taught to label actions when procedure X is used, and Child B can be taught to ask questions by using procedure Y, and Child C can be taught to label objects through procedure Z, then, Child D can be taught all of these things by sequencing procedures X-Y-Z. It is possible that there is an interferring interaction between language concepts that prevents the use of this programming logic.

3. The precise role that imitation training plays in the language remediation process remains unclear. Some language intervention strategies suggest that programming should not be heavily based on imitation procedures (Miller and

Yoder, 1974) while others do (Kent, 1974; Guess, Sailor, and Baer, 1976). It is possible that both approaches are equally successful. Only until No. 1 above is answered will the disagreement surrounding the role imitation plays in the language remediation process become clearer.

4. The language training milieu is rapidly developing as an issue in language training. Some programs emphasize the importance of highly structured settings where a one-to-one melieu exists; others, suggest that a less constrained instructional setting is best (as seen in the Bricker, Dennison, and Bricker /1975/ model). This area needs to be extensively studied.

5. The efficiency of the language intervention process must be judged by how well it is able to teach <u>generalized</u> language use. Thus far, this has not been sufficiently done. NOTE: This issue is treated in detail elsewhere in this report.

6. It is generally agreed that the age of the candidate receiving language training may proved to be an important variable to be considered when selecting a language training strategy. Specifically, most practitioners suggest that intervention should begin as soon as it is possible to detect that a handicapping condition exists. However, there are no data to document that it is any easier to teach a four year old than it is to teach a ten year old, and more importantly, whether a specific procedure works with one group of children but not with another.

CHAPTER V

CONCEPTUAL ISSUES

A comprehensive analysis of the literature pertaining to language acquisition, assessment and intervention reveals several distinct "clusters" of material which may be identified as critical problem areas in the field; areas of relatively recent and intense theoretical and research interest. The four most prominent, or striking areas of conceptual interest which emerge from the analysis, are concerned with the issues of generalization of learned linguistic skills; sequencing of normal, developmental linguistic structures, and its importance for language intervention; the relationship of comprehension to production in developmental linguistics, and its implications for training; and finally, the issue of selection of an intervention curriculum or program from the standpoint of the mode of comprehension or production which is most probable to become functional for a particular person.

These identified problem areas are by no means exhaustive of the array of unanswered questions in the field of remediation of the language impaired. They do, however, represent clusters of intense interest and importance within the stream of ongoing research and theoretical formulation as these bear on the construction of interventive efforts. The purpose of this chapter will be to review analytically, the current and antecedent literature within each of these conceptual problem areas with the intent of providing a picture of the current "state of the art," or level of understanding and predictability within each; and to formulate a set of recommendations for future research efforts.

Generalization

Of all of the unsolved problems confronting those engaged in efforts to train communication skills in non-language handicapped persons, the issue of

generalization is certainly the most current and pressing. As demonstrated in previous chapters, the technology for language assessment and training is in its initial growth years. There are materials available with which to begin the communication training process with non-language persons, and of such a quality as to lead to modest predictions of success over time. At issue, is whether this newly trained complex set of behaviors can and will extend beyond the confines of the particular setting, persons, materials and so on which produced the new skills. In particular, what is needed in the way of environmental programming outside of the training situation, and what is needed in the way of supplemental child training to produce generalization of new language?

Harris (1975) has provided a particularly succinct review of the recent literature on speech intervention with non-verbal children using operant techniques. This review focused on a number of component areas of language training including attention training, non-verbal imitation, verbal imitation, and functional speech and receptive language, all with the issue of generalization of training effects as the case in point. Harris found that in all of the studies reviewed to date in all component areas, generalization of responses to conditions that contained some, but not all of the cues present during training, either failed to be demonstrated to occur or was neither programmed to occur nor measured where it might have occurred.

Harris (1975) speculates from her review that: 1) based on a study by Garcia (1974), generalization may be approached through training by utilizing more than one person to train subjects from the outset; and 2) one of the important factors in facilitating generalization should be repeated training in a wide number of settings. She concludes that language training must focus upon the natural environment rather than the classroom.

Recommendations of these kinds, however, are not met with a freedom from objection by psycholinguists working within a framework of cognitive theory. Ruder and Smith (1974), for example, argue for a cautious use of the term "generative usage," as employed, for example, by Guess, Baer and Sailor (1974). Generative language, from Ruder and Smith's point of view, is a function of a given subject's level of cognitive functioning. They recommend, rather than focusing upon a particular teaching strategy, as suggested by Harris (1975), the language trainer attempt an assessment of a child's level of cognitive functioning, and then combine efforts to raise the child's overall level. Ruder and Smith prefer a Piagetian approach with emphasis on determining cognitive pre-requisites for conceptual behaviors necessary to acquire and maintain functional language use. This approach would, presumably, by leading to the establishment of specific cognitive functions, thereby control a range of specific linguistic behaviors and cause the functions underlying the initially trained behaviors to shift to higher functioning levels, allowing the training of new forms of linguistic expression. The authors, however, conclude that "...(training programs) should also be able to identify and provide training for identification of the appropriate environmental situations which call for use of particular structures" (1974, p. 599). Operationally, this recommendation would seem to correspond quite closely to the second recommendation posed by Harris, above.

Within the operant framework, the concept of generalization has, for over two decades, occupied the status of a passive and somewhat insignificant process; a factor that may well account for past failures on the part of the operant language training group to actively program for language extension, or generalization. Generalization was, simply, regarded as a failure of discrimination. Discrimination was the active process and an improved technology for the production of discrimination learning was felt to lead to the process of generalization

by artifact. If a child was taught a sufficient number of discriminations, generalization would occur without a specific technology of its own.

Stokes and Baer (1975) recently reviewed some 200 studies which might be construed as contributing to a separate technology of generalization, that is, generalization viewed as an active process apart from corresponding or antedating developments in discrimination learning. This review led to the formulation of seven hypothetical tactics which, taken together or in part, may lead to the development of a strategy for the production (or training) of generalization in language deficient children.

The first tactic, called, for want of a better term, "loose training," would consist of a reversal of the usual tactic for producing discrimination learning. Here, the teaching process exerts as little control as possible over the range of stimuli presented and responses allowed in an effort to maximize the potential sampling of the relevant dimensions for transfer to other situations and forms bearing on the class of behavior being trained. Schroeder and Baer (1972), as an exemplar of this approach, compared the teaching of vocal imitation skills to retarded children in two ways. The first emphasized tight restriction over the range of stimuli presented and the range of responses which were reinforced. The second method presented a much greater range of stimuli, and reinforced a much wider range of responses to each stimulus item. The latter training technique resulted in a greater degree of sampled generalization to untrained vocal imitation stimuli interspersed throughout training. The "essense" of the loose training tactic is the abandonment of structured, repetitive lists of training stimuli in favor of a wide sampling of non-repeated items, within each class of responses to be trained, in the hope of promoting generalization to a wider class of stimuli.

A second potential tactic identified by Stokes and Baer is labeled "indiscriminable contingencies." At issue is the programming of an effort to prevent extinction of a learned response, while at the same time, arranging a reinforcement schedule which makes it difficult for the subject of the training effort to discriminate among the specific instances of "reinforceable" stimuli. Pendergrass (1972), as an exemplar, demonstrated that timeout, applied to a particular destructive behavior in a child, also decreased the frequency of another, unrelated behavior which was presumably somehow "chained" to the behavior under management. The process of timeout (extinction) of the managed behavior quite possibly made the contingency of reinforcement for the non-managed behavior more difficult to discriminate, thus promoting generalization of the effects of extinction. The non-managed behavior would, presumably, have undergone a more intermittant reinforcement schedule as a function of the extinction process applied to the behavior to which the non-managed behavior was chained. At issue is whether the tactic of delayed reinforcement can contribute to generalization of linguistic responses by making the times, places and other cues in which a reinforcement contingency actually operates less discriminable to the subject of the language training efforts. Not knowing that reinforcement occurs only in Setting A, the child responds to similar stimuli in Setting B, and so forth.

"Training sufficient exemplars" is a third potential tactic for the teaching of generalization. Sailor (1971), for example, produced both correct and incorrect speech expression by retarded subjects, of two of the plural allophones of spoken English by reinforcing a sufficient number of specific exemplars of the allophone to enable generalization to all other examples of the response class which could be presented. Similarly, Stokes, Baer and Jackson (1974) trained institutionalized retarded children to provide a social greeting response in the presence of a sufficient number of different persons (usually only two or three were necessary)

to enable the children to generalize the greeting to all adults they would encounter around the institution. Generalization training of this type has been referred to as "generative response training" where it has been applied in the language development literature, and constitutes the single most advanced component of the current technology for teaching generalization.

"Programming common stimuli" is a fourth tactic for the development of an active technology for the training of generalization. This tactic implies programming language training in multiple settings. Stokes and Baer (in press), for example, taught one child some word recognition skills and also taught that child how to teach the new skills to a second child (peer tutoring). Both children learned the skills but neither reliably generalized the skills to other settings when the other child was not present in those settings. Upon the introduction of the other child to the new setting, generalization would occur at a greatly increased and stable rate. The common stimulus in this example was the missing child, both in the case of tutor and in the case of learner.

The fifth tactic identified by Stokes and Baer was that of "mediated generalization." This tactic consists of establishing a response which has sufficient commonality between an originally learned response and a new response to enable generalization to occur in the presence of the mediating response. An example of a mediated response producing generalization was provided by Risley and Hart (1968). Children in this study were asked to report on their choice of play objects during a previous free play session. When mention of a particular object was consistently reinforced over time, it was found that the children would report playing with the object even when, in fact, they had not. When, in another experimental condition, the children were differentially reinforced for <u>truthful</u> responses, the verbal report acted as a mediator for

the play response, and the children then actually played with the, presumably undesired, object in order to be able to report it truthfully. This response generalized in the absence of reinforcement sessions.

Similarly, Sailor and Taman (1972) were able to train autistic children to expressively generalize correct usage of the prepositions on and in by reinforcing responses to a mediating stimulus object in the presence of each correct prepositional response. When an attempt was made to mediate both responses with a common stimulus object, prepositional usage failed to generalize. For example, using a toy disk and hat, the experimenters would reinforce the subject for a correct response to "where is the disk?", when the disk was in view inside the hat on some occasions and in view on top of the hat (inverted) in others. Generalization failed to occur in this condition if either object was changed while the other remained constant (hat or disk). When stimulus objects used to train the response "on" were never used to train "in," and vice versa, the children were able to generalize to substitutions. Following successful training on separate mediating stimulus objects, the children were finally able to generalize the two responses to the previously failed, common stimulus sets.

A major promise of this technique for language training lies in the potential of linguistic responses as mediators of both new linguistic and other non-linguistic responses. Guess, Sailor and Baer (in press), for example, as one component of a comprehensive language training program for speech deficient children, train the response, "what's that?" to be displayed in the presence of unfamiliar stimuli which may have desirable consequences for the child. Occasional reinforcing consequences of asking the question during training sessions acts as a verbal mediator for the generalized process of acquiring new linguistic information in normal settings.

The sixth tactic is "training to generalize." Here generalization is treated as an identifiable response class and is, itself, reinforced when it occurs. The few studies of this type of operation which have been published have dealt with the reinforcement of abstractions as a special case of generalization. Teaching concepts such as "same" and "different" are cases in point. Goetz and Baer (1972), for example, differentially reinforced children for constructing different forms with a set of blocks. Under this contingency, children would steadily produce new and novel block forms (different), never reproducing a previously reinforced form.

Research is needed on the issue of reinforcement of generalization to determine, among other things, if linguistic response classes can be brought under reinforcement control in the absence of training tactics such as described above. For example, can generalization be identified to be reinforced when it occurs in the absence of specific training to produce generalization in the first case? Since nearly all handicapped children generalize at least some responses, can the reinforcement of non-linguistic generalizations, produce generalization of linguistic responses?

The final potential tactic identified by Stokes and Baer pertains to the "introduction to natural maintaining contingencies." At issue is the transfer of control from teacher to the natural environment. If so, language training should stress responses which are highly functional for producing reinforcement for the subject outside of the situation in which training occurs. Horner (1971) as an example, taught an orthopedically impaired child to walk on crutches in an experimental setting. The child was prompted to use his crutches to ambulate to other institutional settings to which he had previously been brought in his wheelchair by his various caretakers. The caretakers were asked to refrain from providing help, as they had in the past. This change in the child's natural

ecology enabled him to achieve reinforcement for ambulation on his own in settings which had not been "programmed" by the experimenter. The child generalized and never, to the experimenter's knowledge, returned to his wheelchair.

A point of reapproachment between cognitive psycholinguistics and behaviorism over the issue of language training may be identified in the case of generalization, if, using the seven potential training tactics identified by Stokes and Baer (1975), or as yet inknown training tactics, the phenomenon can be successfully incorporated into a language teaching strategy. To return to the issue raised by Ruder and Smith (1974): if successful language development is a function of a child's "level of cognitive development," and a language teaching strategy should first focus upon efforts to raise the deficient child's overall level of cognitive functioning; then successful training of generalization, both within and without the linguistic repertoire, should contribute immensely to an elevation in cognitive functioning, by almost anyone's definition of the term. The presence of widespread, accurate, and appropriate generalization of behavior changes would certainly suggest the presence of the concept of a processing rule, or underlying strategy.

In summary, very little is known and almost nothing has been demonstrated, that prescriptively leads the language trainer to program for generalization from language instruction settings to non-training settings. It is certain, however, that research on the problem will be forthcoming and has, already, a firm basis for a cogent attack on the problem. Studies must focus on organismic variables, (what must the child know to generalize?), as well as ecological variables (what must take place in the child's non-training world?) to produce the combination of events leading to reliable linguistic generalization.

Sequencing of Linguistic Structures

The conceptual issue of the sequencing of linguistic structures with which to begin language development training with a language deficient person, continues

to be one of the more hotly contested and controversial topics of the field. In its simplest form, the issue asks, what is to be the conceptual basis for structuring the sequence of linguistic components comprising a language training curriculum? The issue speaks to the need for a model of linguistic intervention; a model which is supported logically by psycholinguistic theory and which, ideally, is supported empirically by ongoing as well as antedating research efforts.

Rees (1972) provided a cogent view and outline of the various positions on sequencing of training components through 1970. She was able to identify six separate, and sometimes conflicting models, all of which concentrated heavily upon grammatical structure to the relative exclusion of syntactic-semantic c relationships.

The first model identified by Rees was termed the structual complexity basis. This position argues for abstraction of the rules of grammar, as practiced by adults, provide an order of structual complexity by this analysis, from most complex to least, and begin training at the level of the subjects' existing level of linguistic complexity. Based in part on the theoretical positions of Yngve (1960) and Chomsky (1957), and upon research by Fodor and Garrett (1966) and others, the search for an ordered, structural model continues today. Rees (1972), however, gives the complexity model a vote of no confidence on the basis of failure to achieve a reliable order of complexity based upon sentence structure. Apart from the failure to successfully develop a system for analyzing adult sentences, the proponents of the model must still contend with the unsupported assumption, upon which their position rests, that the order of complexity or difficulty experienced by children in acquiring language corresponds to the levels of complexity (to be identified) in adult speech.

The mean-length-of-utterance model represents a second equivocal approach identified by Rees (1972). Complexity, by this position, takes the form simply of sentence length in speech. Although some empirical support has been obtained for a relationship between developmental age and mean length of utterance (Shriner, 1967), the position is confounded by the complexity of "semantic intentions" (Bloom, 1970) which may correlate negatively, at worse, with length of utterance (Fraser, Bellugi and Brown, 1963).

The dialectical model (Rees, 1972) argues simply that a child will more easily learn the structural patterns heard in his immediate sociological community, than those presented to him in training by a (presumably) more articulate speech clinician. Thus, for example, a black speech deficient child from an impoverished, ghetto environment should receive training in lower class black dialect, and the child of Irish immigrants in South Boston, in Irish putois, etc., since these children will learn most rapidly the constructions which he hears most frequently and consistently. This position, while offering some interesting suggestions from the standpoint of the related issue of generalization, affords essentially nothing to the issue of sequencing the content of language intervention efforts.

The perceptual strategy model identified primarily with the work of Bever (1970a and 1970b) and Ervin-Tripp (1970), focuses primarily upon the receptive process of language, rather than upon expression for the basis for sequencing. By this analysis, the expression of linguistic grammars will be found to be determined by the cognitive process involved in speech perception. Rees (1972) concludes that the search for perceptual strategies employed by children in processing sentences may ultimately provide a fruitful basis for language training by providing a sequence of grammatical structures grounded empirically in terms of difficulty encountered by children in the process of acquisition.

A fifth basis for sequencing identified by Rees is the cognitive position. Assuming that the learning of language is dependent upon underlying cognitive structures, upon which language is "mapped," the language trainer is faced with the task of identifying evidence regarding levels or stages of cognitive development in order to determine the nature and complexity of linguistic structures to be introduced in the training process. Alternately, if language determines cognition, the trainer must sequence structures to advance cognitive development; hence the "language-cognition controversy" (Rees, 1972). Citing the work of Kendler and Kendler (1959) on "the verbal mediation hypothesis," and the work of Bruner, Goodow and Austin (1962) on the "creative function of language," as proponents of language influences (→) cognition, on the one hand; and the work of the "Geneva intellectual fortress" consisting of Piaget and his associates (c.f. Inhelder and Piaget, 1964) as proponents of language (←) influenced by cognition, on the other; Rees (1972) concludes for an absence of any unified basis for a decision model for sequencing grounded in cognitive theory. According to Rees: "From a study of the current experimentation, the working language clinician may find some guidance in developing a theoretical foundation for concrete plans for training. Alternatively, he may conclude that he will use whatever works, regardless of conflicting theoretical implications, on the grounds that 'nothing succeeds like success'" (p. 297).

The final position identified by Rees is the developmental sequence model, by far the most strongly pursued model for sequencing which has appeared to date. This position argues simply that the sequence of linguistic structures for the training of language deficient persons is represented in the sequence with which the normal child displays ontogenetic linguistic development. What remains, in order to firmly anchor this model as a basis for language training, is the formidable task of reliably identifying the sequence of normal linguistic development.

In addition, a further constraint would be imposed by the task of reliably assessing the deficiencies in the linguistic state of the handicapped person, in order to determine the match with the normal sequence which would dictate the onset and immediate objectives of training. This position has made progress through the efforts of McNeil (1970) and Slobin (1970), who argue from the basis of a series of empirical studies for the existence of a natural order and universality of stages of development and emergence of linguistic structures. Rees (1972), however, points out several obstacles to the utilization of the normal developmental sequence model posed, among others, by Menyuk (1964) and Lee (1966), who have shown that grammatical rules displayed by language delayed children are sometimes idiosyncratic and unrepresentative of the rules that normal children display.

Perhaps, the most definitive statement to date of the normal developmental sequence as a basis for language intervention has been put by Miller and Yoder (1972). These investigators concur readily with Slobin (1970) that many linguistic forms cannot be acquired by a language deficient child until the child has reached a level of cognitive development which enables him to grasp the meaning of the form. A language program by Miller and Yoder's (1972a; 1972b) analysis cannot produce language in the absence of the enhancement of cognitive perceptual functioning. The position suffers somewhat from the rather dogmatic pronouncements that certain structures cannot be trained in children who have not mastered precursory structures according to the dictates of theoretical sequencing of normal development. The authors might be on safer ground if, for example, a sufficient body of empirical data were extant to support the hypothesized "normal structural sequence." Miller and Yoder (1972a) state, as one instance, that language training must proceed from comprehension to production. Theoretically, this would seem to be the case; by "common sense" standards,

it is merely a truism to say that the child must understand something before he can express it. Yet, as Guess and Baer (1973) point out, a strategy for training a given linguistic structure can proceed in reverse, that is productively before receptively, with no particular loss or gain to the subsequent development of the form as it is acquired in the other modality. On the basis of existing data from training efforts, it would seem that the "rule" of normal linguistic sequence fails to predict or dictate training success with linguistically deficient persons. Miller and Yoder's position, apart from somewhat premature postulates concerning what should not be taught, when; otherwise blends quite naturally into many structural assumptions of the behavioral position on language training. They argue, for example, that "...each child's target language behavior must have some functional relevance to his environment and to his personal and physical needs." (Miller and Yoder, 1972a; p. 10.) Similarly, the authors call for the employment of "telegraphic speech" as initial stimulus input during training sessions with language deficient children, with the aim of gradually expanding the input to normal usage, consistent with the complexity dimension assumed to hold in the normal developmental sequence. This tactic is employed in the operant training sequence of Guess, Sailor and Baer (1974) pending an experimental analysis of the relative efficacy of expanded versus contracted stimulus forms.

Perhaps the most complete marriage to date of the cognitive-developmental position (normal structural sequence) advocated by Miller and Yoder, and the operant-behavioral position represented most visibly by Guess, Sailor and Baer lies in the training program under development by Stremel and Waryas (1974). This effort comprises an interlocking sequence of language training modules which are themselves sequenced according to current information on normal language development combined with the impact of field test data from application

of the program modules with speech deficient children. The Stremel-Waryas program has proven to be a strikingly successful development based upon field test returns, to date, and appears to suffer only from the relatively high level of linguistic functioning required of the subject for eligibility for entrance into the training process (e.g., comprehension of 25 functional nouns; expression of at least ten nouns in response to pictures or objects, etc.). The Stremel-Waryas effort represents an exciting challenge to, as well as potential empirical support for, the normal developmental sequencing model; and indirectly for the cognitive developmental theories which underlie the proposed sequence. The rigorous experimental method which is applied by Stremel (now Stremel-Campbell) and her associates in Parsons, Kansas, should ultimately produce a sequence for training speech deficient persons, strongly grounded in years of psycholinguistic theory and research. It will indeed be interesting to see the extent to which the empirically determined sequence of the later efforts of this group correspond to, or at least correlate with the initial sequence derived from the present state of knowledge of normal psycholinguistic development.

Still another model for the sequencing of linguistic structures in language training efforts is represented by Carrier (1974) in his introduction to the development of a program for producing a non-speech mode of communication in language deficient persons (Carrier and Peak, 1975). This model, which might be termed the functional analysis position, relies heavily for sequencing on a logical, rather than developmental, basis derived from the work of Premack (1970).

The logic of sequencing derived from the functional analysis framework of Premack differs from the other logical models primarily in its emphasis on function rather than structure. The argument, put simply, is this: Language is a process of operations which has specifiable and discreet functions for the behavior. Linguistically deficient persons have for various reasons, perceptual

and/or behavioral, failed to master the complex response topographies which characterize the various human communication systems. Rather than develop a logic and system for generating the complex topography of, say, speech, after the fact of its failure to develop; the language trainer should concentrate upon supplying the missing functions of language by the most direct route. The establishment of linguistic functions through, in this case, a non-speech (symbol) system, may in turn facilitate the later development of more complex linguistic topographies. A child, by this system needs only to learn discriminations among different symbols, environmental events, and differential sequential arrangements of symbols. When symbol arrangements are matched appropriately to environmental events, functional language is accomplished.

In Carrier's terms:

> "The model generated by this work was in no way intended to simulate any actual process in which humans engage. For example, no attempt was made to accommodate data describing the normal acquisition of language; the normal development process does not appear to be efficient logically, and, indeed, some language-deficient children may fail to learn language because of the inefficiency of that process. The model used in this work is intended only as a definition of operations that can efficiently generate reponses that incorporate linguistic principles--processes that can function in helping to determine sequences, specific steps, and behavior goals for programs." (Carrier, 1974, p. 49.)

The obvious strength of this approach to language training, if successful, is the relatively rapid rate at which children will be able to acquire some of the more potent missing functions for their lives extant in having no communication vehicles. The equally obvious limitation of the approach is the lack of generality of the system for want of an audience to communicate with. The child trained in a symbol system of communication is forever locked into an environment which responds to and with him in the form of plastic symbols. Application of the approach, however, within the context of "total communication"; that is,

the simultaneous extension of training efforts within several communication modes (e.g., symbols and signing), based on the assumption that the easier, functional (symbol) mode will enhance the development of the more complex, but more generally efficient and useful, mode, might ultimately prove to be the most exciting development of all, especially for language training with profoundly retarded persons with severe perceptual impairment.

The final identifiable model for the sequencing of linguistic components in language training might be termed, to return to an earlier quote from Rees (1972), the nothing-succeeds-like-success model. This position, which is basically the strict operant, or empirical model, argues that the conceptual issue of the pre-determination of a linguistic structure upon which to build a language training program, may well be a pseudo issue. While normative data may indicate that normal children use nouns, pronouns and verbs; or express and/or understand one and two word utterances before three and four word utterances, it is an empirical question as to whether one should teach according to the observed frequencies (Guess, Sailor and Baer, 1974). Suppose, for example, that there are specifiable but yet-to-be-determined reasons why linguistically deficient children failed to display language according to the developmental norms. By beginning a language remediation process, utilizing the sequence of structures that failed to take root in the first place, there is a distinct probability of replicating the original failure. The empirical model prefers to assume rather, that an, as yet, empirically unvalidated training sequence for the remediation of linguistic deficiencies may well prove to be far superior to the production of "late" language, than the socio-historically determined sequence which characterizes normal linguistic development.

The initial training sequence, developed by Guess, Sailor and Baer (1974) was not strictly hit or miss as to sequence, but it might have been, to the same

end as the model dictates. The authors relied rather heavily on "pointers" from psycholinguistic theory in structuring the original training sequence, but with some notable deviations, such as the training of expression of a particular grammatical or syntactical structure prior to training the receptive dimension of the source structure. The point is, the position strongly argues for the construction of a sequence which is modifiable on the basis of returns from practice in training. The teaching of "yes" and "no," for example, appeared relatively early in the 1974 version, but was subsequently moved up in the program to a position later in the training sequence, following a substantial return of data from field test efforts indicating failure to learn at that position. Results from the field test of the revised position (Guess, Sailor and Baer, in press) indicate a relatively high rate of success at the revised position. In this example, data from normal developmental sequencing would have predicted the failure (Bateman, 1974). Still other examples would seem to contradict the predictions from normal developmental sequencing (e.g., production succeeds comprehension).

The issue of which sequence should underlie training efforts becomes a pseudo issue if one is willing to grant that a reasonable series of training steps, developed by, say, well-informed hunch, will sort itself out by success or failure when applied to a sufficient populations of linguistically deficient children. The recipients of the training process ultimately determine the structure and sequence of the program rather than the linguistic theorist or clinicians. The issues concerning what should or should not be taught, at what ages, and in what order are left to the children to tell the trainer; by whether they learn or don't learn, and in what order.

The empirical viewpoint was expressed succinctly by Donald Baer at the 1974 Chula Vista conference, quoted in Bateman (1974):

> "...the abstract, conceptual, cognitive or representational relationship is not the independent variable of the study, but the dependent variable (italics added); it is the outcome; it is the result of a set of specified training procedures which we applied and designed in the interests of producing not simply a one-to-one response to those procedures by a generalized response of the nature predictable by the procedures themselves and aimed at by the procedures." (p. 610.)

The cognitive-developmental psycholinguist, on the other hand, frequently treats cognitive factors as independent variables within the child which should be matched to the intended language instruction or input (Bateman, 1974). Nothing succeeds like success.

Reception and Production

One of the critical problem areas confronting the developers of language training programs has been, and continues to be, the relationship between reception, or understanding, and production, or expressive language. Stated very simply, the issue comes down to one of order and position in a training sequence. Should the language trainer develop comprehension of a given linguistic structure before training expression of that form; vice versa; or does it matter? Interestingly, a number of highly credible proponents of all three positions can be found. This may come as a surprise to many who, unaware of the present controversy, might well take for granted a view of the developmental relationship between the two, in language acquisition, of the form: comprehension of linguistic forms necessarily precedes production of those forms at each step along the way. After all, in order to talk about something, you must first understand it. Or do you?

Perhaps the best way to highlight the conceptual issue involved in the reception-production controversy is to study the most recent and cogent challenge to its basic tenet. Bloom (1974) has postulated that the relationship between the two forms is multidirectional in development, involving shifts between

mutually dependent but quite different underlying processes. This analysis represents a significant departure from traditional psycholinguistic theory. Bloom's position is illustrated, in part, by the case of the young child's first words. Children use words inappropriately as they acquire linguistic skills. They show that they have heard a word but that, if comprehension may be equated with understanding, they did not understand it. Whether the child will come to understand the word may well depend upon what happens after the child has produced it. A similar phenomenon characterizes the normal child's language acquisition toward the end of the second year, in the period of transition from single word utterances to longer, sustained speech. The child need not comprehend the syntactic-semantic structure characterizing a sentence to be able to respond to the sentence appropriately when there is a direct reference to the environmental context in which the sentence occurs. The child does not have to process syntax in order to respond to relationships among words with immediate identity forms. Where, however, environmental referrants are not immediate (the book, or ball, for example, is not present in the context of "give me"), knowledge of syntax and the constraints of semantics is necessary for an appropriate response, i.e., comprehension. If then, different cognitive processes are involved, by Bloom's analysis, in the learning of words and grammars, and in the comprehension and production of structured speech; then the assumption of undirectionality of comprehension to production is highly questionable (also c.f. Chapman and Miller, 1973). A child's use of lexical items, grammatical forms, semantic forms, word order, etc., may contribute more to the child's comprehension of those forms than initial comprehension contributes to later production. The answer to the question, "how can an individual use a linguistic structure or form without knowing about it?", is answerable if one is willing to settle for a level of "knowing" that consists, simply, in having

perceived that structure or form. Understanding then develops through use of the structure or form in different contexts, some of which are responded to as if correct, some as if incorrect.

Bloom (1974) concludes that the comprehension-production issue may hold different consequences for language training which is aimed at the development of speech which is largely representational by the immediate environmental context, e.g., Piaget's (1956) stage of concrete operations; from that which determines to carry the speaker to the level of formal logical operations, which characterize the linguistic processes of the normal child at about age 12. The critical transition for the child's language development occurs at the level of the shift to the ability to speak about and understand events, relationships and factors which are independent of external situations or immediate internal states. While language training for the achievement of linguistic skills at the concrete level might well proceed, in the basis of present knowledge, from initial training or production to later training on comprehension, the relationship of the two is less clear at higher stages of development. In short, according to Bloom, there are simply no guideposts to assist the language trainer. There are, however, strong grounds to question old assumptions concerning language development.

David Ingram (1974) has recently updated the more traditionally accepted thesis that comprehension precedes production in normal language development and, therefore, dictates the preferred directionality of efforts toward the instantiation of linguistic skills in the handicapped. According to Ingram (1974), ...<u>comprehension ahead of production is a linguistic universal of acquisition</u>...(p. 313).

Classical psycholinguistic theory has operated upon various postulates of this basic assumption since the early 1950's (c.f. Karlin and Strazzula, 1952).

Chomsky (1967), for example, postulates "deep" biological structures which are related to the "surface" structures of language by "grammatical transformations" of formal operations which are unlearned abstract processes determining the use of grammar. These transformations are universal across different languages and, at present, beyond scientific conceptualization. The processes which underlie the learning of grammar are innate properties of man's biological nature. This position is frequently buttressed by citing a famous case study reported by Lenneberg (1962) of a child who had an understanding of language and a knowledge of grammar even though he had a congenital disability for the acquisition of motor speech skills. Lenneberg relates both reception and expression to a single set of organizing principles which are selected in understanding and speaking. This principle makes it possible for a child to know grammatical rules without having speech and without having imitated the rules of others.

For reasons to be discussed later, the position that comprehension of the full range of forms of a linguistic grammar precedes production of any of those forms, is no longer defensible. Ingram (1974), however, has chosen to defend the position that "...some comprehension of a specific grammatical form or construction occurs before it is produced." (p. 316.) Differences, however, in the respective positions taken by Bloom and Ingram seem to dissolve at their various points of juncture regarding specific linguistic forms. For example, to return to the example of "first words," Ingram (1974) states that his position makes no claim that first words understood by a child must necessarily be the first words produced. The claim, rather, is that the first words produced must have been "noticed," a possible function of attention, memory and frequency of exposure. Bloom (1974) treated the issue of "knowing" a word as, simply, having perceived (heard) the word. At this particular juncture, the distinction between Bloom's position and the, presumably, opposite position espoused by Ingram appears to be purely semantic, if a distinction can be said to exist at all.

At the juncture of some of the "higher" or more complex forms of language development, the respective positions of Bloom and Ingram differ only in polemic. Bloom's takes the conservative position that too little is known about how children move from concrete to logical operations to enable guidance on the issue of training order of comprehension and production; Ingram cites the complexities displayed as evidence for comprehension necessarily proceeding production in training strategies. Ingram concludes that the more fruitful area for research on the conceptual issue of reception and comprehension should consist of an effort to shed light on the gap between the two in the acquisition of language, rather than attempting to determine which should precede the other. Ingram's position, in recognizing that receptive and productive language are really much closer together than has been assumed in the past, is really not at variance with Bloom's position, that research efforts need to be directed at uncovering the interactive relationship between the two modes at various stages in the attainment of linguistic competence.

Language analysts working from within the operant-behavioral context have approached the issue of comprehension and production somewhat more pragmatically than have the cognitive-developmental analysts. Rather than study the issue from the standpoints of observation and manipulation of language development in young normal children, proponents of the behavioral model have sought to attach directly the question of which should be trained first when attempting to remediate language deficiencies in the handicapped. In so doing, they have arrived at a theoretical position on the issue indirectly, from empirical data to theoretical stance. Interestingly, the current behavioral position is not at variance with either the stance taken by Bloom (the two may develop independently) or that of Ingram (the issue is the gap between the two through various stages of development). The method employed by the operant researchers to attempt

to answer the question is one which has a long history in scientific research within many disciplines: the creation of a laboratory model or analog of a naturally occurring process, in order to isolate the components of the process through direct control and subsequent observation. The results of research of this type have direct relevance to language training efforts with linguistically deficient children to the extent that the training methods employed are derived from the procedures which, at least partially, comprised the analog, and which are applied to subjects who resemble those studied in the laboratory situation. To extrapolate, on the other hand, from the outcomes of the laboratory research model back to the issue of normal development requires acceptance of at least two rather broad assumptions. The first is that the language deficient, retarded person will acquire language by essentially the same process that the young normal child acquires it, but much more slowly, and only with intensive, sequentially applied training procedures. The second assumption is that the relationship between reception and production as linguistic processes can be uncovered by studying the separate process of generalization across the two under specifiable training conditions. In other words, given a language deficient subject, who displays neither reception of, nor expression of, a specifiable linguistic form or structure, can one, using the laboratory analog, produce with training either process and systematically detect the extent to which either process influences the acquisition of the other (untrained) process? If this can be done, then the assumption is that these findings indeed shed light upon the relationship of the two processes in normal, developmental language acquisition.

The sequence of studies which utilized the analogic method to treat the comprehension-production issue were conducted by Guess (1969), Harrelson (1969), Guess and Baer (1973a), and were summarized with implications for language training efforts in Guess and Baer (1973b). Finally, the outgrowth of these

studies determined in part the sequence of training strategy employed in the authors' language development program for speech deficient persons (Guess, Sailor and Baer, 1976, in press).

Guess (1969) examined reception and production using the plural morpheme as the unit of linguistic analysis. He established the receptive discrimination as correct pointing to single or paired objects in response to singular or plural labels, across successive training pairs, until generalization occurred to all (untrained) pairs and singulars of items presented. Unreinforced "probes" of production of plural endings to the items and pairs were interspersed during receptive training, to determine generalization to the untrained process. With two retarded children as subjects, neither subject demonstrated generalization from correct receptive plurals to correct productive plurals. The same subjects were next trained, with new sets of items, in correct productive plurals. The procedure was then replicated in reverse order. Again, unreinforced probes of productive plural usage showed independence from the reversed receptive repertoire just established, in that the unreversed plural usage (taught previously) was still displayed.

Harrelson (1969) replicated the procedure with other subjects but trained production first and probed for generalization to reception. His results replicated those of the Guess study and concluded for functional independence of the two repertoires, when produced by laboratory analog. Neither the Guess nor Harrelson study, however, demonstrated adequately that either process would or would not facilitate the <u>acquisition</u> of the other repertoire, apart from consideration of generalization from one to the other. If establishing one repertoire first could be shown to <u>facilitate</u> the learning of the other repertoire, then a conclusion might be warranted that one repertoire should precede the other in language training (and perhaps that one repertoire precedes and influences the other developmentally).

To shed light on this issue, Guess and Baer (1973) taught the generalized pluralization rules concurrently in both the receptive and productive modalities. The rules were established in each modality only for a specific class of plurals: those ending in -s for one modality; those ending in -es for the other. Generalization occurred within but not across modalities. Three of four subjects trained did not evidence generalization from receptive training with one class of plurals to correct productive use of that class, nor did they evidence generalization from productive training of the other class of plurals to correct receptive response to that class. The fourth subject, however, generalized both ways. The authors' concluded that language trainers would do well to program teaching within both modalities for any new linguistic form or structure to be taught, at least until the student displays a transition across the two processes, probably at quite a late period in language instruction, if he or she begins training with very few linguistic skills.

The results of these studies would seem to support Bloom's (1974) position, that reception and production represent functionally independent processes at early stages in either language development of normal children, or language acquisition in response to training efforts with language deficient children. Also, corresponding to Bloom's analysis, the results of these studies can shed little, if any, light on the relationship of the two processes in later stages of more advanced language usage.

Baer (Chapman, 1974, pp. 342-343) has argued on the basis of these studies, that empirical differences in the relative levels of development in comprehension and production skills evidenced by normal or handicapped children, reflect simply the differential reinforcement contingencies operating in the language learner's environment. The "gap" between comprehension and production, frequently found in language samples of normal children at various ages and stages

of development, was produced, by experimental analog, in both processes simultaneously for different allomorphs of the same morphological class. Similarly, generalization across modalities was produced, by the analog, through the process of differential reinforcement (Guess and Baer, 1973a). The implication of this analysis for training has already been stated: train both modalities simultaneously or in rapid succession. It doesn't matter which is trained first when successive training steps are employed. The implication for theoretical psycholinguistics, in accounting for normal language development, would seem to predict wide individual differences, depending upon the social (reinforcement) context in which the language learner develops. Perhaps cross-cultural research into evidence for gaps in comprehension and production at early stages of language acquisition will shed further light on the issue of normal development.

Program Selection

The final conceptual issue is simultaneously the most directly practical and the least developed of the problem areas identified in this report. The issue is the identification or formulation of a strategy for matching an appropriate language development system to a particular linguistically handicapped child. The selection strategy must take into account: the nature of the child's handicapping conditions, which may or may not dictate a hypothesis as to why the child failed to develop speech and/or receptive language; the availability of various types of language intervention systems, which must take into consideration: the existing skills or training required of the language developers available to the child; the child's environmental situation; the child's type and degree of linguistic development, including any medical factors which might significantly affect his prognosis for further development within the same modalities; and the therapeutic or educational goals for the child's linguistic development.

The current "state of the art" of language development or intervention systems consists of the parallel development of a number of communication skill programs, some of which concentrate upon speech and receptive spoken language, and some of which are geared to the development of language systems which do not involve the spoken word. In the case of linguistically deficient children with severe perceptual-motor problems, the selection of a program for remediation is usually determined by the type of receptive or expressive impairment, where no other particularly handicapping conditions are assumed to be present. In the case of the severely, multihandicapped child, however, program selection seems rather to be determined, at worse, randomly, and at least, as a function of the child's degree of linguistic impairment. In the latter case, for example, the selection of a non-speech system for language development for a severely deficient, profoundly retarded child, might be made on the basis of a judgment or prediction that the child is constitutionally incapable of attaining speech and spoken reception; a judgment which is based on an assumption that the modalities of speech are more complex than those of the non-speech communication systems. This assumption has been, however, neither supported nor disconfirmed by empirical research. A second basis for selection of modality of training has arisen from the difficulty encountered in establishing the most basic or preliminary responses to speech development in non-vocal children. These efforts have relied upon various strategies, usually involving some form of contingent reinforcement, for the instantiation of vocal imitation. The relative ease with which a non-vocal response system may be generated, on the other hand, such as pointing to items on a communication board, making simple hand signs, or manipulating symbols, has led, in many cases, to the selection of a non-speech communication program, at least for the initial efforts at language interventions.

The obvious solution to the dilemma would, of course, lie in comprehensive assessment. If the language developer were in a position to rely upon firm empirical data from a given child which specified the exact nature and degree of any existing perceptual impairments, motoric deficiencies effecting mode of expression, the existing state of linguistic development within all modalities of reception and expression, and an exact specification of learning impairment, then he could formulate precise predictions about the short and long range effects of various language development strategies and make a reasonable decision as to which program to match with his particular subject. Unfortunately, the current state of the art of assessment falls far short of enabling this kind of predictive reasoning as a solution to the matching problem. Children are frequently mis-diagnosed as blind, as deaf, as paraplegic, and so on. These labels, once applied to a child, tend to rule out intervention strategies on the part of the child's care-giver which might well succeed. Not long ago, if a child was labeled severely retarded, all attempts to teach linguistic skills were ruled out as hopeless exercises in futility.

The most that can be said toward a solution to the problem of matching program with child is that there are presently no rules. The most promising developments in the field of speech and language assessment are audiological. The combination of operant audiology and the impedance bridge provides a powerful set of tools for the specification of hearing loss. But even these breakthroughs provide little of substance to the selection issue. Without doubt, the most desirable of all of the modes of human communication is receptive and expressive speech, simply because it contains far and away the largest social context for maintenance and continued language development. It provides the child his largest "audience" with which to communicate. Through the media of lip-reading and voice boxes as channels of receptive and expressive spoken language, the

deaf child need not have to settle for non-speech modes of communication, with the social restrictions imposed by these alternatives. The greater problem, however, remains of determining the type and degree of communication that a given child is capable of achieving within the current state of language development technology.

Within the non-speech systems, the field of language prosthesis (Lindsley, 1964) has undergone extensive development within the last decade. Hollis and Carrier (1975) have classified prosthetic methods for circumventing language deficiencies as:

1. Prosthetic environments. Specially programmed environmental settings, sometimes automatized, to provide stimuli and consequences designed to enhance language development.

2. Phonologic prosthesis. Devices for the production of expressive speech (e.g., voice boxes) which are mediated motorically by systems which bypass the larynx.

3. Phonologic and auditory prosthesis: gestural mode. Sign systems involving hand and finger movements.

4. Phonologic and auditory prosthesis: synthetic mode. Symbol systems, fixed (communication board) or manipulate (physical objects).

Success in teaching language to children with various handicapping conditions, including retardation, have been reported with each of the four prosthetic, compensatory modes (Hollis and Carrier, 1975). The authors' conclude that of all of the programmatic developments within the various prosthetic modes, the synthetic mode affords the most promising development for the development of linguistic skills in severely handicapped (retarded) children. Based on Premack's work with chimpanzees (Premack and Premack, 1972), Carrier and Peak (1975) have reported successful application of a manipulable symbol system toward the

development of at least rudimentary communication skills in severely and profoundly retarded children. The ultimate utility of a prosthetic system such as that developed by Carrier and Peak will, of course, lie in the capability of the system to transfer communication skill development across modes, that is, from non-speech communication to speech and spoken receptive language. Hollis and Carrier (1975) hypothesize that mastery of non-speech language facilitates the learning of speech by eliminating the need for simultaneous mastery of linguistic principles during speech acquisition. Communication is instantiated by learning the functions of language through symbol manipulation. The transfer from symbols to speech might then be facilitated through the mediation process of linguistic function. Acquisition of linguistic structures and forms would then follow the expression (and reception) of the functions of speech, rather than compete with its development. The child, in other words, having acquired linguistic structure and form through the medium of a functional communication system, which is, presumably, less complex to master than speech, then transfers to the more difficult speech mode without the necessity of simultaneously mastering linguistic structure and form. This argument certainly presents an intriguing challenge to the laborious process of beginning speech training, through the vehicle of imitation, with non-vocal, profoundly retarded children. It rests, however, on two untested and unproved assumptions. First, that non-speech language development can result in speech development more rapidly or more efficiently than direct speech and language training. Second, that transfer from non-speech communication to speech and spoken receptive language will occur. It is quite possible that the mediation hypothesis will not hold, as in the case of reception and production discussed earlier, and that the two modes of communication will develop, if at all, independently. It is, to be sure, hoped that the assumptions will eventually be substantiated

by research. Guess, Sailor and Baer (in press, 1976), have determined through efforts to train speech and spoken receptive language to over 250 non-vocal, severely retarded children, that approximately one third of the children of this category will fail to acquire generalized vocal imitation through application of a number of training strategies dictated by the current technology of imitation training. Of the two remaining two thirds, approximately two years of training time will be required simply to produce the degree of generalized vocal imitation sufficient to enable the child to begin functional expressive speech. Of course, the state of the art of imitation training is itself, constantly undergoing refinement and revision and the ultimate training time to achieve this beginning stage in speech development may be significantly reduced. Nevertheless, the promise of a non-speech mediatory system which might significantly reduce this training time is a hopeful development indeed. On the pessimistic side, it is difficult to accept the argument that beginning speech development is hampered by the simultaneous process of acquiring linguistic form and structure. There is no linguistic structure involved in vocal imitation. It is match-to-sample with the larynx. If a child can learn the complexities of linguistic structure through the mechanism of a non-speech mode, any savings in the transfer to speech would have to come <u>after</u> the establishment of generalized vocal imitation. Guess, Sailor and Baer (in press, 1976) demonstrated that <u>following</u> the development of generalized vocal-verbal imitation, the profoundly retarded child shows a very rapid acquisition of functional speech and language, relative to the initial imitation training time. With each successively more complex training step, the average number of trials required to teach the step decreases almost as a linear function. The grounds for pessimism lie in the observation that the most difficult aspect of speech and language development seems to be the acquisition of the motoric and

discriminative components of the mode, rather than the acquisition of the functions of language or its linguistic forms and structures.

Hollis, Carrier and Spradlin (1976) have reported the beginnings of a system for classification of language remediation strategies as a function of learning deficiencies, or handicapping conditions; the first conceptual system of its type to be reported in the literature to date. The system, based on an earlier conceptualization of the "functional operant" by Lindsley (1964) analyzes the language development decision process as a function of stimulus (sensory) input modes; integrative (mediational) processes; and response (motoric) output modes.

The input channels available to the language trainer include the visual, auditory, tactile and olfactory modes. These four modes form a kind of heirarchy of preference as channels for sensory input. Failure of the higher order (probability of success) channels, including failure to prosthetize the deficiency, can lead to the selection of a lower order sensory input channel.

The integrative processes are conceptualized as measurable cognitive functions which form a heirarchy with respect to (assumed) memory requirements. These integrative modes are labeled imitative (match-to-sample), nonimitative (match-across-sample), constructive (part to whole), and transformative. The transformative process is of the highest order in the heirarchy and consists in generating new responses or configurations, given old ones. Transformative processes are, by definition, creative.

The output processes or channels, are given as gross motor, sign (finger language), write (including prosthesis such as communication board manipulation or typewriter), and speech. Speech is regarded to be the highest order of response mode because of the complexity of production in phonological expression.

Utilizing the three dimensional model provided by Hollis, Carrier and Spradlin, the various efforts of language trainers can be categorized with reference to handicapping conditions of their subject population. Premack (1970) for example, taught rudimentary language functions to chimpanzees (a genetically handicapping condition?) utilizing visual input, imitative and non-imitative integration, and gross motor output. The Guess, Sailor and Baer (in press, 1976) language development program utilizes auditory and visual input channels, all four integrative and mediational process levels, and culminates in speech as the output response mode.

The research program implied by the Hollis, Carrier and Spradlin model is largely aimed at determining the parameters of potential transfer across the modes which constitute the heirarchies within each of the three dimensions of the model. Within the output mode, for example, can the acquisition of speech be facilitated by the development of a lower order motoric output system such as signing? Bricker and Bricker (1974) have argued, for example, that successfully acquired motoric gestures (e.g., clapping hands) can mediate the acquisition of imitated speech sounds through a process of chaining. Research on language training dictated by this model, may hold promise for the future substantiation of negation of some or all of the troublesome assumptions underlying the abandonment of speech and receptive spoken language development in favor of lower-order modality language training for profoundly handicapped children.

The most that can be concluded at present is that which program for which child is very much an open question. Until it can be demonstrated that non-speech programs facilitate the acquisition of speech and language in those children who are not neurologically or medically incapable, even with prosthesis, of attaining this mode of communication, then the intervention effort of choice must remain speech and spoken receptive language. This, because of the severe

social developmental restrictions implicit in non-speech communication. In the case of the profoundly retarded, non-vocal child, only the very deaf and/or the very blind populations would seem to warrant exception from this rule.

Recommendations

1. Support research efforts leading to the identification of:

a) organismic variables requisite for generalized language usage

b) ecological variables requisite for generalized language usage

c) combinations of the two requisite for generalized language usage

Studies leading to the production of generalized language usage (from class or language training lab, to all settings) should receive a top research priority.

2. Research should examine success in training as a function of linguistic sequencing of training steps. Empirical support for a training sequence would allow program developers to concentrate on training methods rather than repeat previous errors in determining what to teach and when.

3. Research should be conducted which sheds light on the interaction of reception and production at early stages of language acquisition and later stages of functional language usage. Experiments on this subject should be closely related to the empirical efforts to establish training sequences, as outlined in 2 above.

4. Research is needed to provide empirical support for or against the "total communication" hypothesis--Can we replace imitation training as a precursor to speech and language training with signing or symbol systems (apart from perceptual impairments) as a motor-mediated facilitator of speech acquisition? This idea is being widely promulgated, but no data has been forthcoming.

References

Acker, L. E., Kelley, W. R., Mason, C. R., and McAmmond, D. M. Short-term, team implemented behaviour modification of speech in a young boy. Canadian Journal of Behavioral Science, 1973, 5, 174-182.

Azrin, N. H., Kaplan, S. J., and Foxx, R. M. Autism reversal: Eliminating stereotyped self-stimulation of retarded individuals. American Journal of Mental Deficiency, 1973, 78, 241-248.

Ausman, J. O. and Gaddy, M. R. Reinforcement training for echolalia: Developing a repertoire of appropriate verbal responses in an echolalic girl. Mental Retardation, 1974, 12, 20-21.

Baer, D. M. and Guess, D. Receptive training of adjectival inflections in mental retardates. Journal of Applied Behavior Analysis, 1971, 4, 129-139.

Baer, D. M. and Guess, D. Teaching productive noun suffixes to severely retarded children. American Journal of Mental Deficiency, 1973, 77, 498-505.

Baer, D. M., Peterson, R. F., and Sherman, J. A. The development of imitation by reinforcing behavioral similarity to a model. Journal of the Experimental Analysis of Behavior, 1967, 101, 405-416.

Baer, D. M., Wolf, M. M., and Risley, T. R. Some current dimensions for applied behavior analysis. Journal of Applied Behavior Analysis, 1968, 1, 91-97.

Barton, E. S. Inappropriate speech in a severely retarded child: A case study in language conditioning and generalization. Journal of Applied Behavior Analysis, 1970, 3, 209-307.

Barton, E. S. Operant conditioning of social speech in the severely subnormal and the use of different reinforcers. British Journal of Social and Clinical Psychology, 1972, 2, 387-396.

Bateman, B. Discussion summary - Language intervention for the mentally retarded. In R. L. Schiefelbusch and L. L. Lloyd (Eds.), Language perspectives: Acquisition, retardation and intervention. Baltimore: University Park Press, 1974.

Beissel, G. F. Increasing verbalizations by a disadvantaged preschool child. Psychological Reports, 1972, 30, 931-934.

Bennett, C. W. and Ling, D. Teaching a complex verbal response to a hearing impaired girl. Journal of Applied Behavior Analysis, 1972, 5, 321-327.

Berko, J. The child's learning of English morphology. Word, 1958, 14, 150-177.

Bever, T. G. The cognitive basis for linguistic structures. In J. Hayes (Ed.), Cognition and the development of language. New York: John Wiley and Sons, 1970.

Bever, T. G. The comprehension and memory of sentences with temporal relations. In G. B. Flores d'Arcais and W. J. M. Levelt (Eds.), Advances in psycholinguistics. New York: American Elsevier, 1970.

Blake, J. N. The therapeutic construct for two seven-year-old nonverbal boys. Journal of Speech and Hearing Disorders, 1969, 34, 363-369.

Bloom, L. Language development: Form and function in emerging grammars. Cambridge: Massachusetts Institute of Technology Press, 1970.

Bloom, L. One word at a time: The use of single word utterances before syntax. The Hague: Mouton, 1973.

Bloom, L. Talking, understanding, and thinking. In R. L. Schiefelbusch and L.L. Lloyd (Eds.), Language perspectives: Acquisition, retardation, and intervention. Baltimore: University Park Press, 1974.

Bloom, L. Why not a pivot grammar? Journal of Speech and Hearing Disorders, 1971, 36, 40-50.

Bowerman, M. Early Syntactic Development. London: Cambridge University Press, 1973.

Bowerman, M. Structural relationships in children's utterances: Syntactic or semantic? Paper presented at the University of New York at Buffalo Summer Linguistics Institute, 1971.

Bricker, D. Imitative sign training as a facilitator of word-object association with low-functioning children. American Journal of Mental Deficiency, 1972, 76, 509-516.

Bricker, W. A., and Bricker, D. An early language training strategy. In R. L. Schiefelbusch and L. L. Lloyd (Eds.), Language perspectives: Acquisition, retardation and intervention. Baltimore: University Park Press, 1974.

Bricker, W. A. and Bricker, D. Development of receptive vocabulary in severely retarded children. American Journal of Mental Deficiency, 1970, 74, 599-607.

Bricker, W. A. and Bricker, D. D. Four operant procedures for establishing auditory stimulus control with low-functioning children. American Journal of Mental Deficiency, 1969, 73, 981-987.

Bricker, W. A. and Bricker, D. Receptive vocabulary as a factor in the discriminative performance of low functioning children. American Journal of Mental Deficiency, 1971, 5, 599-605.

Bricker, D., Dennison, L., and Bricker, W. A. Constructive interaction-adaptation approach to language training. MCCD Monograph Series No. 7, Mailman Center for Child Development, University of Miami, Miami, Florida, 1975.

Bricker, D., Vincent-Smith, L. and Bricker, W. A. Receptive vocabulary: Performances and selection strategies of delayed and nondelayed toddlers. American Journal of Mental Deficiency, 1973, 77, 579-584.

Brown, R. A first language: The early stages. Cambridge: Harvard University Press, 1973.

Brown, R. and Bellugi, U. Three processes in the child's acquisition of syntax. Harvard Educational Review, 1964, 34, 133-151.

Bruner, J. S., Goodnow, J. and Austin, G. A. A study of thinking. New York: Wiley, 1956.

Buddenhagen, R. G. Establishing vocal verbalizations in mute mongoloid children. Champaign: Research Press Co., 1971.

Butz, R. A. and Hasazi, J. E. The effects of reinforcement on perseverative speech in a mildly retarded boy. Journal of Behavior Therapy and Experimental Psychiatry, 1973, 4, 167-170.

Calhoun, J. and Koenig, K. P. Classroom modification of elective mutism. Behavior Therapy, 1973, 4, 700-702.

Carrier, J. K. Application of functional analysis and non-speech response mode to teach language. American Speech and Hearing Association Monograph, 1974, 18, 47-95.

Carrier, J. K. and Peak, T. NON-SLIP (Non-speech language initiation program). Lawrence, Kansas: H & H Enterprises, Inc., 1975.

Carroll, J. B. Language development in children. In S. Sparta (Ed.), Psycholinguistics: A book of readings. New York: Holt, Rinehart, and Winston, 1961.

Chapman, R. S. Discussion summary-developmental relationships between receptive and expressive language. In R. L. Schiefelbusch and L. L. Lloyd (Eds.), Language perspectives: Acquisition, retardation and intervention. Baltimore: University Park Press, 1974.

Chapman, R. S. and Miller, J. F. Early two and three word utterances: Does production precede comprehension? Paper presented at the Fifth Annual Child Language Research Forum, Stanford University, Stanford, April, 1973.

Chomsky, N. Aspects of the theory of syntax. Cambridge: MIT Press, 1965.

Chomsky, N. The general properties of language. In C. Millikan and F. Darley (Eds.), Brain mechanisms underlying speech and language. New York: Grune and Stratton, 1967.

Chomsky, N. Review of Skinner's "Verbal Behavior." Language, 1959, 35, 26-58.

Chomsky, N. Syntactic structures. The Hague: Mouton and Co., 1966.

Clark, H. B. and Sherman, J. A. Teaching generative use of sentence answers. Journal of Applied Behavior Analysis, 1975, 8, 321-330.

Cofer, C. Comment on the paper by Brown and Fraser. In C. Cofer and B. Musgrave (Eds.), Verbal behavior and learning: Problems and processes. New York: McGraw-Hill, 1963.

Drash, P. W. and Leibowitz, J. M. Operant conditioning of speech and language in the nonverbal retarded child-recent advances. Pediatrics Clinics of North America, 1973, 20, 233-243.

Dunn, L. M., Horton, K. B., and Smith, J. O. The Peabody language development kits for level #P. Minneapolis: American Guidance Service, Inc., 1968.

Ervin, S. M. Imitation and structural change in children's language. In E. Lenneberg (Ed.), New directions in the study of language. Cambridge: MIT Press, 1964.

Ervin-Tripp, S. Discourse agreement: How children answer questions. In J.R. Hayes (Ed.), Cognition and the development of language. New York: Wiley, 1970.

Fodor, J. A. and Garrett, M. Some reflections on competence and performance. In J. Lyons and R. J. Wales (Eds.), Psycholinguistic papers: The proceedings of the 1966 Edinburg conference. Edinburg: Edinburg University Press, 1966.

Fraser, C., Bellugi, U., and Brown, R. Control of grammar in imitation, comprehension, and production. Journal of Verbal Learning and Verbal Behavior, 1963, 2, 121-135.

Friedman, R. and Karagan, N. Characteristics and management of elective mutism in children. Psychology in the Schools, 1973, 10, 249-252.

Frisch, S. A. and Schumaker, J. B. Training generalized receptive prepositions in retarded children. Journal of Applied Behavior Analysis, 1974, 7, 611-621.

Fulton, R. T. and Lloyd, L. L. Audiometry for the retarded: With implications for the difficult-to-test. Baltimore: The Williams & Wilkins Company, 1969.

Fulton, R. T. and Spradlin, J. E. Operant audiometry with severely retarded children. Audiology, 10, 1971, 203-211.

Fulton, R. T., Spradlin, J. E., and Lloyd, L. L. Operant audiometry with the severely retarded: Positive reinforcement discrimination. Bureau of Child Research, University of Kansas and Parsons State Hospital and Training Center, 16mm film, 1968.

Garber, N. B. and David, L. E. Semantic considerations in the treatment of echolalia. Paper presented at the American Speech and Hearing Association convention, Las Vegas, November, 1974.

Garcia, E. The training and generalization of a conversational speech form in nonverbal retardates. Journal of Applied Behavior Analysis, 1974, 7, 137-149.

Garcia, E., Guess, D., and Byrnes, J. Development of syntax in a retarded girl using procedures of imitation, reinforcement, and modeling. Journal of Applied Behavior Analysis, 1973, 6, 299-310.

Goetz, E. M. and Baer, D. M. Social control of form diversity and the emergence of new forms in children's block building. Journal of Applied Behavior Analysis, 1973, 6, 209-217.

Goldstein, S. B. and Lanyon, R. I. Parent-clinicians in the language training of an autistic child. Journal of Speech and Hearing Disorders, 1971, 36, 552-560.

Gray, B. and Ryan, B. A language program for the nonlanguage child. Champaign: Research Press, 1973.

Guess, D. A functional analysis of receptive language and productive speech: Acquisition of the plural morpheme. Journal of Applied Behavior Analysis, 1969, 2, 55-64.

Guess, D. and Baer, D. M. An analysis of individual differences in generalization between receptive and productive language in retarded children. Journal of Applied Behavior Analysis, 1973a, 6, 311-329.

Guess, D. and Baer, D. M. Some experimental analyses of linguistic development in institutionalized retarded children. In B. B. Lahey (Ed.), The modification of language behavior. Springfield: Charles C Thomas, 1973b.

Guess, D., Ensminger, E. E. and Smith, J. O. A language development program for mentally retarded children (Final Report, Project No. 7-0815). U.S.O.E. Bureau of Education for the Handicapped, 1969.

Guess, D., Sailor, W. and Baer, D. M. Functional speech and language training for the severely handicapped: Part I: Persons and things. Lawrence, Kansas: H & H Enterprises, Inc., 1976.

Guess, D., Sailor, W. and Baer, D. M. To teach language to retarded children. In R. Schiefelbusch and L. Lloyd (Eds.), Language perspectives: Acquisition, retardation and intervention. Baltimore: University Park Press, 1974.

Guess, D., Sailor, W., Rutherford, G. and Baer, D.M. An experimental analysis of linguistic development: The productive use of the plural morpheme. Journal of Applied Behavior Analysis, 1968, 1, 225-235.

Harrelson, A. Effects of productive speech training on receptive language. Unpublished Masters thesis, University of Kansas, 1969.

Harris, S. L. Teaching language to nonverbal children - with emphasis on problems of generalization. Psychological Record, 1975, 82, 565-580.

Hart, B. and Risley, T. R. Community-based language training. Paper prepared for the Conference on Early Intervention with High Risk Infants and Young Children, sponsored by the President's Committee on Mental Retardation and the Association for Childhood Education International, 1974.

Hart, B. M. and Risley, T. R. Establishing use of descriptive adjectives in the spontaneous speech of disadvantaged preschool children. Journal of Applied Behavior Analysis, 1968, 1, 109-120.

Hart, B. and Risley, T. R. Incidental teaching of language in the preschool. Journal of Applied Behavior Analysis, 1975, 8, 411-420.

Hartung, S. M. and Hartung, J. R. Establishing verbal imitation skills and functional speech in autistic children. In B.B. Lahey (Ed.), The modification of language behavior. Springfield: Charles C Thomas, 1973.

Hollis, J. H. and Carrier, J. K. Research implications for communication deficiencies. Exceptional Children, 1975, 41, 405-412.

Hollis, J. H., Carrier, J. K., and Spradlin, J. E. An approach to remediation of communication and learning deficiencies. In L. L. Lloyd (Ed.), Communication Assessment and Intervention Strategies. Baltimore: University Park Press, 1976.

Horner, R. D. Establishing use of crutches by a mentally retarded spina bifida child. Journal of Applied Behavior Analysis, 1971, 4, 183-180.

Ingram, D. The relationship between comprehension and production. In R. L. Schiefelbusch and L. L. Lloyd (Eds.), Language perspectives: Acquisition, retardation, and intervention. Baltimore: University Park Press, 1974.

Inhelder, B. and Piaget, J. The early growth of logic in the child. London: Routledge and Kegan Paul, 1964.

Jackson, D. A. and Wallace, R. F. The modification and generalization of voice loudness in a fifteen-year-old retarded girl. Journal of Applied Behavior Analysis, 1974, 7, 461-471.

Jeffree, D., Wheldall, K. and Mittler, P. Facilitating two-word utterances in two Down's Syndrome boys. American Journal of Mental Deficiency, 1973, 78, 117-122.

Johnston, M. K. Echolalia and automatism in speech : A case report. In H. N. Sloane, Jr. and B. D. MacAulay (Eds.), Operant procedures in remedial speech and language training. Boston: Houghton Mifflin, 1968.

Karlin, I. W. and Strazzula, M. Speech and language problems of mentally deficient children. Journal of Speech and Hearing Disorders, 1952, 17, 286-294.

Keilitz, I., Tucker, D. J., and Horner, R. D. Increasing mentally retarded adolescents' verbalizations about current events. Journal of Applied Behavior Analysis, 1973, 6, 621-630.

Kendler, H. H. and Kendler, T. S. Vertical and horizontal processes in problem-solving. Psychological Review, 1962, 69, 1-16.

Kent, L. Language acquisition program for the severely retarded. Champaign, Illinois: Research Press, 1974.

Keogh, W. J. The evaluation of a nonverbal child's spontaneous utterances as training items for vocal imitation. In D. Guess, W. Sailor, and L. Lavis (Eds.), Five Research Reports, Kansas Neurological Institute, Topeka, Kansas, 1974.

Lahey, B. B. Modification of the frequency of descriptive adjectives in the speech of Headstart children through modeling without reinforcement. Journal of Applied Behavior Analysis, 1971, 4, 19-22.

Lee, L. L. Developmental sentence types: A method for comparing normal and deviant syntactic development. Journal of Speech and Hearing Disorders, 1966, 31, 311-330.

Lenneberg, E. H. Biological foundations of language. New York: Wiley, 1967.

Lenneberg, E. H. The capacity for language acquisition. In J. A. Foder and J. J. Katz (Eds.), The structure of language: Readings in the philosophy of language. Englewood Cliffs, New Jersey: Prentice-Hall, 1964.

Lenneberg, E. H. Understanding language without ability to speak: A case report. Journal of Abnormal and Social Psychology, 1962, 65, 419-425.

Lindsley, O. R. Direct measurement and prothesis of retarded behavior. Journal of Education, 1964, 147, 62-81.

Lloyd, L. L., Spradlin, J. E., and Reid, M. J. An operant audiometric procedure for difficult-to-test patients. Journal of Speech and Hearing Disorders, 1968, 33, 236-245.

Lovaas, O. I. A behavior therapy approach to the treatment of childhood schizophrenia. In J. P. Hill (Ed.), Minnesota Symposium on Child Psychology. Minneapolis: University of Minnesota Press, 1967.

Lovaas, O. I. A program for the establishment of speech in psychotic children. In J. K. Wing (Ed.), Childhood autism. Oxford: Pergamon Press, 1966.

Lovaas, O. I., Berberich, J. P., Perloff, B. F., and Schaeffer, B. Acquisition of imitative speech by schizophrenic children. Science, 1966, 151, 705-707.

Lovaas, O. I., Schreibman, L., Koegel, R., and Rehm, R. Selective responding by autistic children to multiple sensory input. Journal of Abnormal Psychology, 1971, 77, 211-222.

Lovell, K. and Bradbury, B. The learning of English morphology in educationally subnormal school children. American Journal of Mental Deficiency, 1967, 71, 609-615.

Lovitt, T. C. and Smith, J. O. Effects of instructions on an individual's verbal behavior. Exceptional Children, 1972, 38, 685-693.

Lutzker, J. R. and Sherman, J. A. Producing generative sentence usage by imitation and reinforcement procedures. Journal of Applied Behavior Analysis, 1974, 7, 447-460.

Lynch, J. and Bricker, W. A. Linguistic theory and operant procedures: Toward an integrated approach to language training for the mentally retarded. Mental Retardation, 1972, 10, 12-17.

MacDonald, J. D. Environmental language intervention: Programs for establishing initial communication in handicapped children. In F. Withrow and C. Nygren (Eds.), Language curriculum and materials for the handicapped learner. Columbus: Charles E. Merrill Publishing Co. (in press, 1976).

MacDonald, J. D. and Blott, J. P. Environmental language intervention: The rationale for a diagnostic and training strategy through rules, context, and generalization. Journal of Speech and Hearing Disorders, 1974, 39, 244-256.

MacDonald, J. D., Blott, J. P., Gordon, K., Bernard, S., and Hartmann, M. An experimental parent-assisted treatment program for preschool language delayed children. Journal of Speech and Hearing Disorders, 1974, 39, 395-415.

MacDonald, J. D. and Nichols, M. Environmental language inventory. Columbus: The Nisonger Center, Ohio State University, 1974.

Marshall, N. R. and Hegrenes, J. R. Programmed communication therapy for autistic mentally retarded children. Journal of Speech and Hearing Disorders, 1970, 35, 70-83.

Matheny, A. P. Pathological echoic responses in a child: Effect of environmental mand and tact control. Journal of Experimental Child Psychology, 1968, 6, 624-631.

McDonnell, H. J., Fredericks, H. O., and Grove, D. N. The teaching research initial expressive language program. Monmouth, Oregon: Teaching Research Publications, 1975.

McNeil, D. The acquisition of language: The study of developmental psycholinguistics. New York: Harper and Row, 1970.

Menyuk, P. Comparison of grammar children with functionally deviant and normal speech. Journal of Speech and Hearing Research, 1964, 7, 109-121.

Miller, J. F., and Yoder, D. E. A language acquisition program for the retarded. In J. E. McLean, D. E. Yoder and R. L. Schiefelbusch (Eds.), Language intervention with the retarded. Baltimore: University Park Press, 1972.

Miller, J. F. and Yoder, D. E. An ontogenetic language teaching strategy for retarded children. In R. Schiefelbusch and L. Lloyd (Eds.), Language perspectives: Acquisition, retardation and intervention. Baltimore: University Park Press, 1974.

Miller, J. F. and Yoder, D. E. A syntax teaching program. In J. E. McLean, D. E. Yoder and R. L. Schiefelbusch (Eds.), Language intervention with the retarded: Developing strategies. Baltimore: University Park Press, 1972.

Miller, J. F. and Yoder, D. E. On developing the content for a language teaching program. Mental Retardation, 2, 9-11.

Norman, A. and Broman, H. J. Volume feedback and generalization techniques in shaping speech in an electively mute boy: A case study. Perceptual and Motor Skills, 1970, 31, 463-470.

Nolan, J. D. and Pence, C. Operant conditioning principles in the treatment of a selectively mute child. Journal of Consulting and Clinical Psychology, 1970, 35, 265-268.

Odom, R. D., Liebert, R. M., and Fernandez, L. E. Effects of symbolic modeling on the syntactical productions of retardates. Psychonomic Science, 1969, 17, 104-105.

Odom, M., Longhurst, T. M., and Boatman, R. R. Improving oral language skills in a classroom for the educable mentally retarded. Education and Training of the Mentally Retarded, 1973, 8, 187-193.

Pendergrass, V. E. Timeout from positive reinforcement following persistent, high-rate behavior in retardates. Journal of Applied Behavior Analysis, 1972, 5, 85-91.

Phillips, S., Liebert, R. M., and Poulos, R. W. Employing paraprofessional teachers in a group language training program for severely and profoundly retarded children. Perceptual and Motor Skills, 1973, 36, 607-616.

Piaget, J. The language and thought of the child. New York: World Publishing, 1962.

Premack, A. J. and Premack, D. Teaching language to an ape. Scientific American, 1972, 277, 92-99.

Premack, D. A functional analysis of language. Journal of Experimental Analysis of Behavior, 1970, 14, 107-125.

Rees, N. S. Bases of decision in language training. Journal of Speech and Hearing Disorders, 1972, 37, 283-304.

Reid, J. B., Hawkins, N., Keutzer, C., McNeal, S. A., Phelps, R. F., Reid, K. M., and Mees, H. L. A marathon behavior modification of a selectively mute child. Journal of Child Psychology and Psychiatry and Allied Disciplines, 1967, 8, 27-30.

Risley, T. R., and Hart, B. Developing correspondence between the nonverbal and the verbal behavior of preschool children. Journal of Applied Behavior Analysis, 1968, 1, 267-281.

Risley, T., and Wolf, M. Establishing functional speech in echolalic children. Behaviour Research and Therapy, 1967, 5, 73-88.

Rosenbaum, E., and Kellman, M. Treatment of a selectively mute third-grade child, Journal of School Psychology, 1973, 11, 26-29.

Ruder, K. F. and Smith, M. D. Issues in language training. In R. L. Schiefelbusch and L. L. Lloyd (Eds.), Language perspectives: Acquisition, retardation and intervention. Baltimore: University Park Press, 1974.

Rubin, B. K. and Stolz, S. B. Generalization of self-referent speech established in a retarded adolescent by operant procedures. Behavior Therapy, 1974, 5, 93-106.

Sailor, W. Reinforcement and generalization of productive plural allomorphs in two retarded children. Journal of Applied Behavior Analysis, 1971, 4, 305-310.

Sailor, W. and Saunders, R. R. Towards behavioral analysis of meaning. Working Paper # 73, Kansas Neurological Institute, Research Department, 1975.

Sailor, W. and Taman, T. Stimulus factors in the training of prepositional usage in three autistic children. Journal of Applied Behavior Analysis, 1972, 5, 183-190.

Sanders, R. M. A timeout procedure for the modification of speech content: A case study. Journal of Behavior Therapy and Experimental Psychiatry, 1971, 2, 199-202.

Sapon, S. M. Shaping productive verbal behavior in a non-speaking child: A case report. Georgetown University Monograph series on language and linguistics, 1966, 19, 157-175.

Saunders, R. R., Sailor, W., and Taylor, C. An experimental analysis of three strategies on reinforcement on two-choice discrimination learning problems with retarded children. Unpublished manuscript, Kansas Neurological Institute, 1976.

Schlesinger, I. M. Production of utterances and language acquisition. In D. I. Slobin (Ed.), The ontogenesis of grammar. New York: Academic Press, 1971.

Schlesinger, I. M. Relational concepts underlying language. In R. L. Schiefelbusch and L. L. Lloyd (Eds.), Language perspectives: Acquisition, retardation and intervention. Baltimore: University Park Press, 1974.

Schroeder, G. L. and Baer, D. M. Effects of concurrent and serial training on generalized vocal imitation in retarded children. Developmental Psychology, 1972, 6, 293-301.

Schumaker, J. and Sherman, J. A. Training generative verb usage by imitation and reinforcement procedures. Journal of Applied Behavior Analysis, 1970, 3, 273-287.

Sherman, J. A. Use of reinforcement and imitation to reinstate verbal behavior in mute psychotics. Journal of Abnormal Psychology, 1965, 70, 155-164.

Shriner, T. H. A comparison of selected measures with psychological scale values of language development. Journal of Speech and Hearing Research, 1967, 10, 828-835.

Siegel, G. M. Language behavior of adults and retarded children in interpersonal assemblies. Journal of Speech and Hearing Disorders, Supplement 10, 1963, 32-53.

Simkins, L., Kingery, M., and Bradley, P. Modification of cluttered speech in an emotionally disturbed child. The Journal of Special Education, 1970, 4, 81-88.

Skinner, B. F. Verbal behavior. New York: Appleton-Century-Crofts, 1957.

Sloane, H. N., Johnston, M. K., and Harris, F. R. Remedial procedures for teaching verbal behavior to speech deficient or defective young children. In H. N. Sloane and B. MacAulay (Eds.), Operant procedures in remedial speech and language training. Boston: Houghton Mifflin Company, 1968.

Slobin, D. Imitation and grammatical development in children. In N. Endler, L. Boulter, and H. Osser (Eds.), Contemporary issues in developmental psychology. New York: Holt, Rinehart and Winston, 1968.

Slobin, D. I. Universals of grammatical development in children. In G. B. Flores d'Arcais and W. J. M. Levelt (Eds.), Advances in psycholinguistics. Amsterdam: North Holland, 1970.

Spradlin, J. E., Lloyd, L. L., Hom, G. L., and Reid, M. M. Establishing tone control and evaluating the hearing of severely retarded children. In G. A. Jervis (Ed.), Expanding concepts in mental retardation. Springfield: Charles C Thomas, 1968.

Spradlin, J. E. and Rosenberg, S. Complexity of adult verbal behavior in a dyadic situation with retarded children. Parsons Research Project Working Paper 18, 1959.

Staats, A. Behaviorism and cognitive theory in the study of language: A neopsycholinguistics. In R. L. Schiefelbusch and L. L. Lloyd (Eds.), Language perspectives: Acquisition, retardation, and intervention. Baltimore: University Park Press, 1974.

Stevens-Long, J. and Rasmussen, M. The acquisition of simple and compound sentence structure in an autistic child. Journal of Applied Behavior Analysis, 1974, 7, 473-479.

Stewart, J. I. Speech and language training programs for developmentally disabled children (Teacher's Guide). Portland, Oregon: Multnomah County Intermediate Education District, 1973.

Stokes, T. F. and Baer, D. M. An implicit technology of generalization. Unpublished manuscript, University of Kansas, 1975.

Stokes, T.F., Baer, D. M., and Jackson, R. L. Programming the generalization of a greeting response in four retarded children. Journal of Applied Behavior Analysis, 1974, 7, 599-610.

Stremel, K. Language training: A problem for retarded children. Mental Retardation, 1972, 10, 47-49.

Stremel, K. and Waryas, C. A behavioral-psycholinguistic approach to language training. American Speech and Hearing Monographs, 1974, 18, 96-124.

Striefel, S. Teaching a child to imitate. Lawrence, Kansas: H & H Enterprises, Inc., 1974.

Sulzbacher, S. I. and Costello, I. M. A behavioral strategy for language training of a child with autistic behaviors. Journal of Speech and Hearing Disorders, 1970, 35, 256-277.

Tawney, J. W. and Hipsher, L. W. Systematic instruction for retarded children: Experimental edition/Part III: Systematic language instruction. Danville, Illinois: Interstate Printers and Publishers, Inc., 1972.

Tramontana, J. and Shivers, O. Behavior modification with an echolalic child: A case note. Psychological Reports, 1971, 29, 1034.

Turnbull, W. An examination of two stimulus control methods in training generalized vocal imitation in infants. Unpublished Master's thesis, University of Kansas, 1975.

Wheeler, A. J. and Sulzer, B. Operant training and generalization of a verbal response form in a speech deficient child. Journal of Applied Behavior Analysis, 1970, 3, 139-147.

Wildgen, J. "Once upon a time..." or how to teach retarded children to tell stories --- toward conversational speech. Unpublished Doctor's dissertation, The University of Kansas, 1974.

Wolf, M., Risley, T., and Mees, H. Application of operant conditioning procedures to the behavior problems of an autistic child. Behaviour Research and Therapy, 1964, 1, 35-312.

Yngve, V. A model and a hypothesis of language structure. Proceedings of the American Philosophical Society, 1960, 104, 444-466.